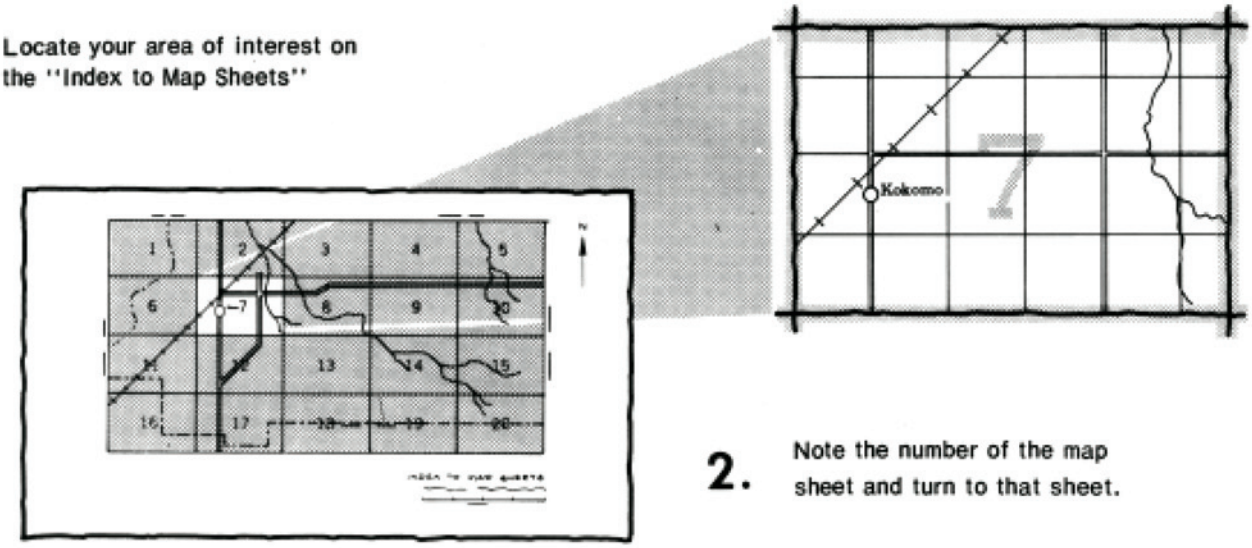
Soil Survey of

Brown and Mills Counties, Texas

United States Department of Agriculture
Soil Conservation Service
in cooperation with Texas Agricultural Experiment Station

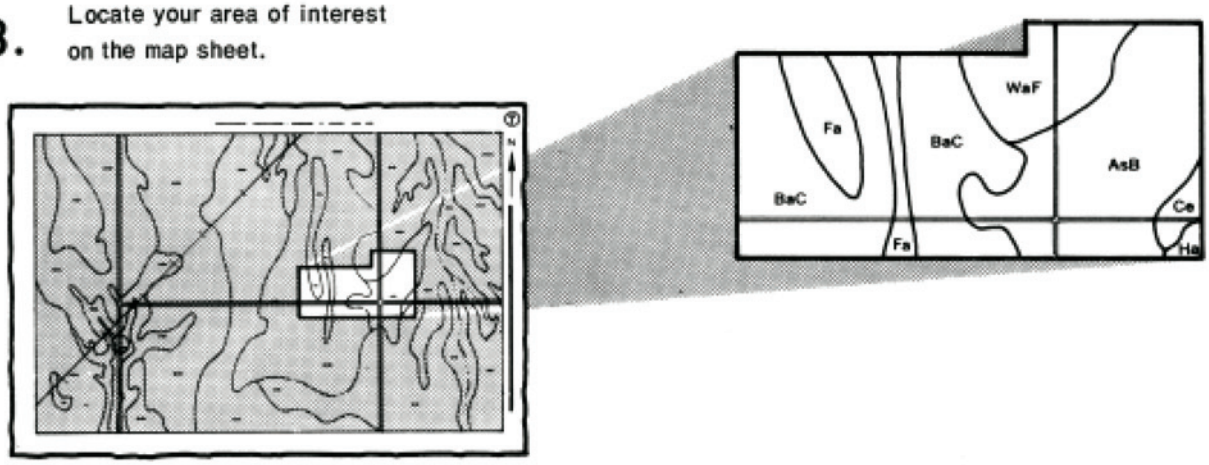
HOW TO USE

1. Locate your area of interest on the "Index to Map Sheets"

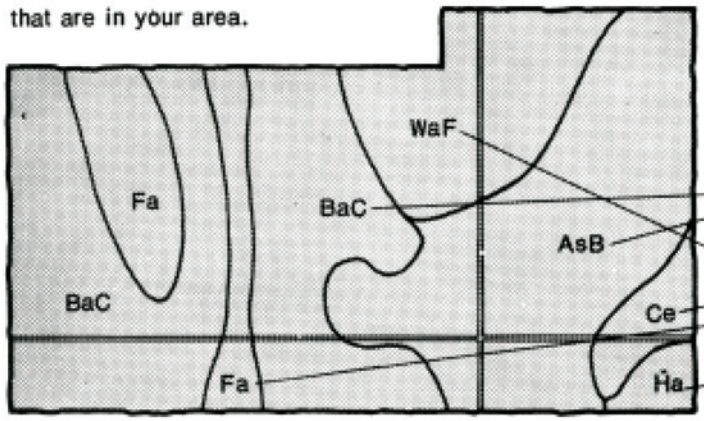


2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.



4. List the map unit symbols that are in your area.

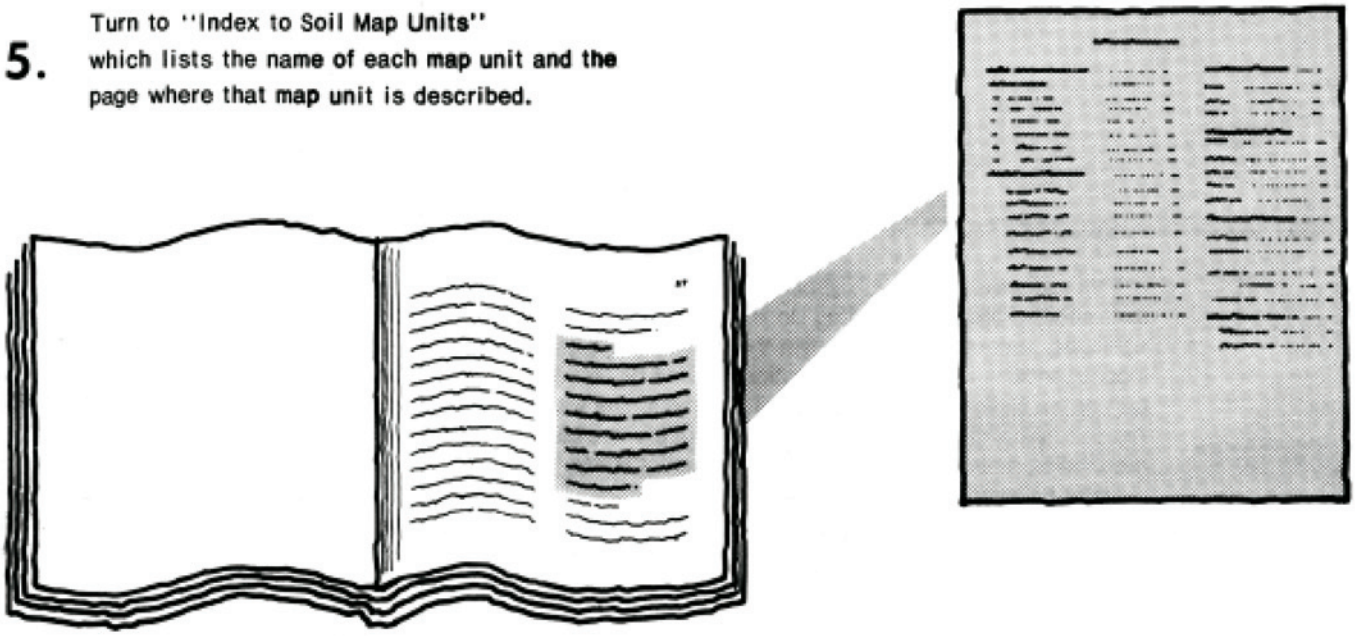


Symbols

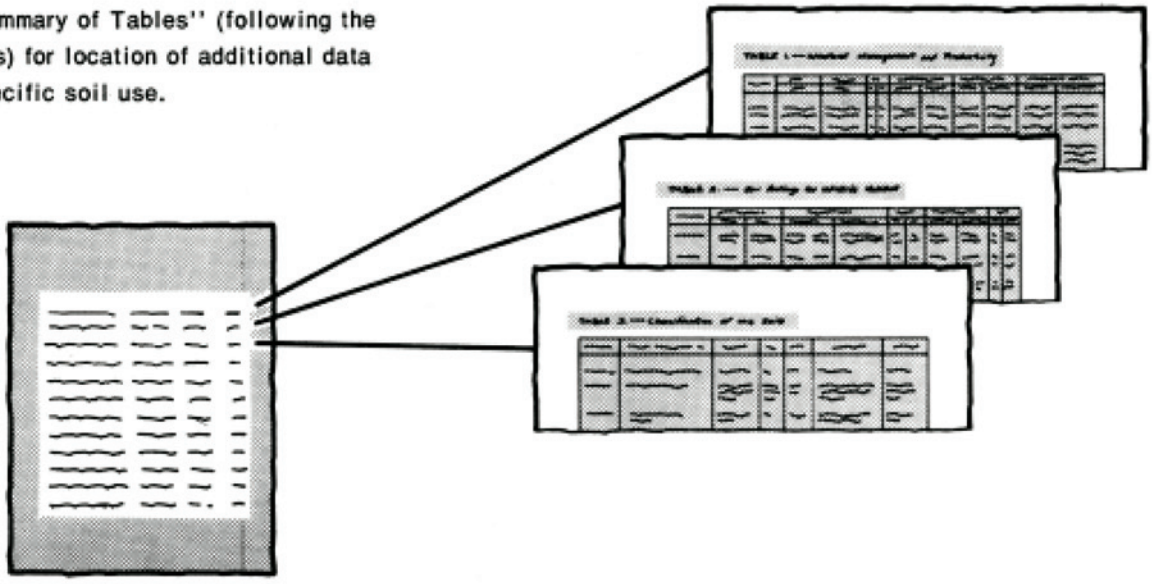
- AsB
- BaC
- Ce
- Fa
- Ha
- WaF

THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; to specialists in wildlife management, waste disposal, or pollution control.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was performed in the period 1968-1974. Soil names and descriptions were approved in 1975. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1975. This survey was made cooperatively by the Soil Conservation Service and the Texas Agricultural Experiment Station. It is part of the technical assistance furnished to the Brown-Mills Soil and Water Conservation District.

Cover: Native pecans and Coastal bermudagrass on Frio silty clay loam, occasionally flooded.

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Issued December 1980

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Foreword

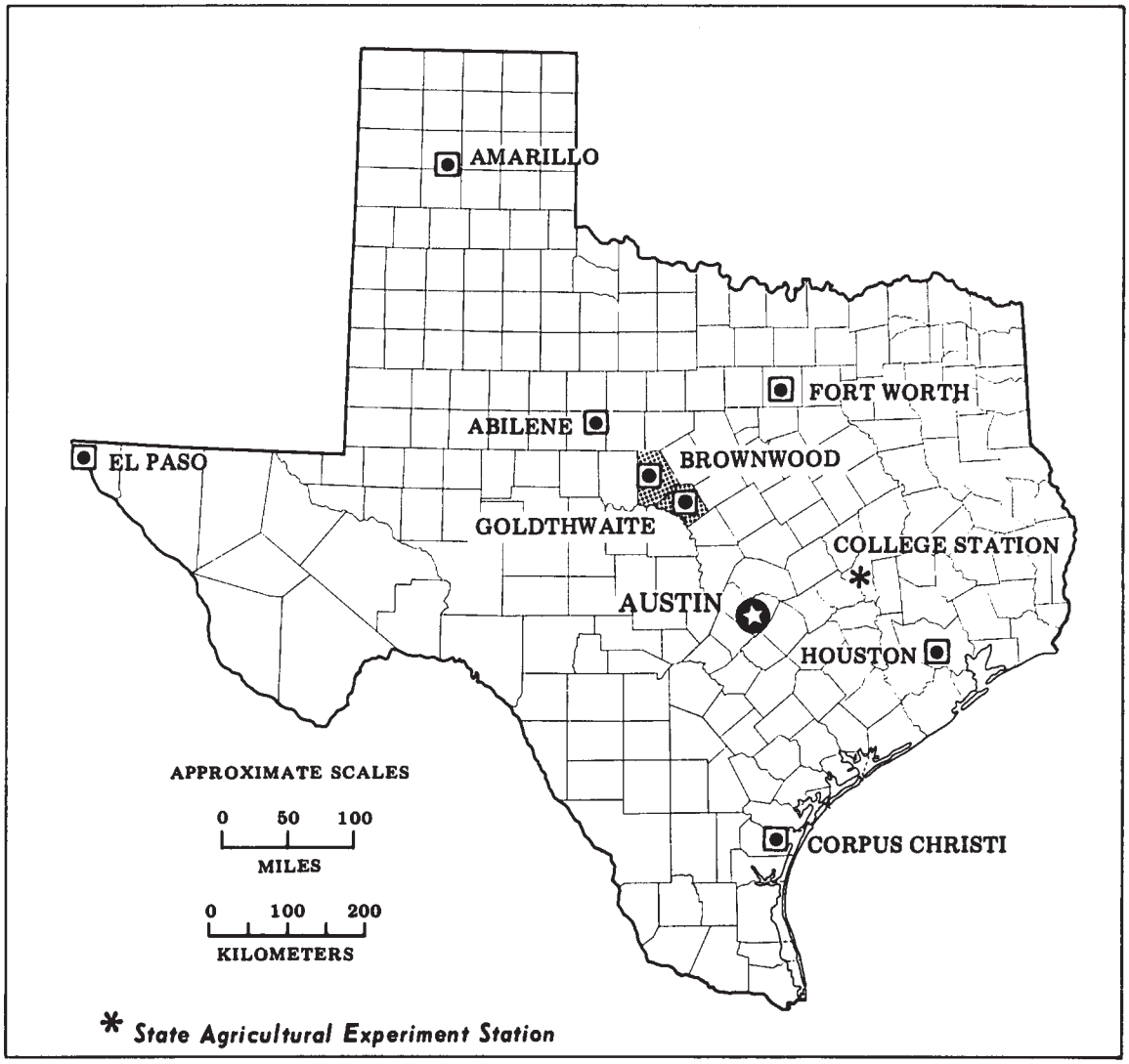
This soil survey contains information that can be used in land-planning programs in Brown and Mills Counties, Texas. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.

George C. Marks
State Conservationist
Soil Conservation Service



Location of Brown and Mills Counties in Texas.

SOIL SURVEY OF Brown and Mills Counties, Texas

United States Department of Agriculture, Soil Conservation Service,
in cooperation with Texas Agricultural Experiment Station

By Dennis F. Clower, Soil Conservation Service
Soils surveyed by J. David Kelly, O. L. Botts, O. W. Bynum, John L. Coker, and R. B. Hailey,
Soil Conservation Service, in cooperation with Texas Agricultural Experiment Station

The survey area includes all of Brown and Mills Counties, Texas. It is northeast of the geographic center of the State. The Colorado River forms the southern boundary for both counties. The total area is 1,084,800 acres.

The pattern of soils in Brown and Mills Counties is complex. Four major geologic formations have influenced the nature of the soils, and here three major land resource areas converge. The soils of the Grand Prairie, in the eastern part of the survey area, and the soils of the Texas North Central Prairies, in the western part, formed mainly under grass vegetation and are dominantly dark colored and loamy and clayey. The soils of the West Cross Timbers, in the northern part, formed under post oak savannah and are dominantly light colored and sandy and loamy. Management concerns are generally related to slope. All but the nearly level soils are susceptible to sheet and gully erosion unless they are protected.

General nature of the counties

This section was prepared for those who want general information about Brown and Mills Counties. It discusses briefly the history of the counties, climate, agriculture, and natural resources.

History

Brown County was organized in 1857. It was formed from parts of Comanche and Travis Counties in 1859 by an act of the State Legislature. It was reduced to its present size in 1887. The county was named for Captain Henry S. Brown, who fought in the Texas Revolution. He first came to the area in 1828.

Brown County is irregular in shape and has a total area of 961 square miles, or 615,040 acres, including 7,360 acres of water. Brownwood, located in the geographical center of the county, is the county seat. Other principal towns are Early, Bangs, Blanket, May, and Zephyr.

The county had a population of 8,414 in 1880. The population grew rapidly until about 1920, then decreased from 26,382 to 25,924 by 1940. In 1970 the population was 25,877.

Mills County was organized in 1887. It was formed from parts of Brown, Comanche, Hamilton, and Lampasas Counties. The county was named for the pioneer jurist, John T. Mills.

Mills County is irregular in shape and has a total area of 469,760 acres or 734 square miles. Goldthwaite, located in the center of the county, is the county seat. Mullin is another important town. Mills County had a population of 5,493 in 1890. The population grew until about 1910, then decreased from 9,694 to 4,212 by 1970.

Climate

Prepared by the National Climatic Center, Asheville, North Carolina.

Brown and Mills Counties are hot in summer but cool in winter, when an occasional surge of cold air causes a sharp drop in otherwise mild temperatures. Rainfall is uniformly distributed throughout the year, reaching a slight peak in spring. Snowfall is infrequent. Annual total precipitation is normally adequate for cotton, feed grains, and small grain.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Brownwood, Texas in the period 1951 to 1976. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 47 degrees F, and the average daily minimum temperature is 34 degrees. The lowest temperature on record, which occurred at Brownwood on January 13, 1973, is 0 degrees. In summer the average temperature is 83 degrees, and the average daily maximum temperature is 96 degrees. The highest recorded temperature, which occurred on August 7, 1964, is 111 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (50 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

Of the total annual precipitation, 16 inches, or 60 percent, usually falls in April through September, which includes the growing season for most crops. In 2 years out of 10, the rainfall in April through September is less than 12 inches. The heaviest 1-day rainfall during the period of record was 6.60 inches at Brownwood on October 5, 1959. Thunderstorms occur on about 40 days each year, and most occur in May.

Average seasonal snowfall is 2 inches. The greatest snow depth at any one time during the period of record was 7 inches. On an average, 1 day has at least 1 inch of snow on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 50 percent. Humidity is higher at night, and the average at dawn is about 70 percent. The sun shines 80 percent of the time possible in summer and 70 percent in winter. The prevailing wind is from the south-southeast. Average windspeed is highest, 14 miles per hour, in spring.

Tornadoes and severe thunderstorms occur occasionally. These storms are local and of short duration, and the pattern of damage is variable and spotty.

Agriculture

Cattle ranching was the first agricultural enterprise in the survey area. The availability of inexpensive land and nutritious grasses made the area especially suitable for livestock raising.

About 79 percent of the survey area is used as grazing land. Livestock raising consists mainly of cow-calf operations or of growing sheep for the production of wool and lambs. Angora goats, swine, horses, and poultry are also raised.

Cropland makes up approximately 20 percent of the survey area. Oats, wheat, sorghums, and peanuts are the main crops. Pecan, peach, and apple orchards do well on some soils in the survey area.

Natural resources

Soil is the most important natural resource in the two-county area. Forage for livestock and food and fiber for market and home consumption are produced in the survey area.

Water is another natural resource. Lake Brownwood furnishes municipal water for Brownwood, Early, Bangs, Zephyr, Brookesmith, and most of the western rural part of Brown County. This lake also provides excellent recreational facilities and irrigation water. Many floodwater retarding structures have been built in the county to help prevent flood damage. Most of these lakes are used for recreation and for livestock watering (fig. 1).

Wildlife produced on the farms and ranches provides recreation and income for many residents.

Other natural resources are limestone, which is crushed for road construction; oil and gas; and sand and gravel.

How this survey was made

Soil scientists made this survey to learn what soils are in the survey area, where they are, and how they can be used. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; the kinds of native plants or crops; and the kinds of rock. They dug many holes to study soil profiles. A profile is the sequence of natural layers, or horizons, in a soil. It extends from the surface down into the parent material, which has been changed very little by leaching or by plant roots.

The soil scientists recorded the characteristics of the profiles they studied and compared those profiles with others in nearby counties and in more distant places. They classified and named the soils according to nationwide uniform procedures. They drew the boundaries of the soils on aerial photographs. These photographs show trees, buildings, fields, roads, and other details that help in drawing boundaries accurately. The soil maps at the back of this publication were prepared from aerial photographs.

The areas shown on a soil map are called map units. Most map units are made up of one kind of soil. Some are made up of two or more kinds. The map units in this survey area are described under "General soil map for broad land use planning" and "Soil maps for detailed planning."

While a soil survey is in progress, samples of some soils are taken for laboratory measurements and for engineering tests. All soils are field tested to determine their characteristics. Interpretations of those characteristics may be modified during the survey. Data are assembled from other sources, such as test results, records, field experience, and state and local specialists. For example, data on crop yields under defined management are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it can be used by farmers, rangeland and woodland managers, engineers, planners, developers and builders, home buyers, and others.

Figure 1.—A floodwater retarding structure in an area of Doudle-Real association, undulating.

General soil map for broad land use planning

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, a map unit consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one unit can occur in other units but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

The soils in the survey area vary widely in their potential for major land uses. Table 4 shows the extent of the map units shown on the general soil map. It lists the potential of each, in relation to that of the other map units, for major land uses and shows soil properties that limit use. Soil potential ratings are based on the practices commonly used in the survey area to overcome soil limitations. These ratings reflect the ease of overcoming the limitations. They also reflect the problems that will persist even if such practices are used.

Each map unit is rated for *cultivated crops, rangeland, pastureland, urban uses,* and *recreation*. Cultivated crops are those grown extensively in the survey area. Rangeland refers to land growing native vegetation to be used for forage. Pastureland is land growing improved grasses. Urban uses include residential, commercial, and industrial developments. Recreational areas are campsites, picnic areas, ballfields, and other areas that are subject to heavy foot traffic.

Very shallow to deep, loamy and clayey soils on uplands

This group of map units makes up about 65 percent of the two-county survey area. The soils are mainly stony

and are very shallow to deep. Slopes are 1 to 30 percent but mainly are 2 to 8 percent. Most areas of these soils are suited to rangeland and wildlife habitat.

1. Callahan-Throck-Bonti

Gently sloping to hilly, moderately deep to deep, stony, loamy soils over sandstone or shale

This map unit is made up of gently sloping to hilly soils on uplands. Slopes range from 1 to 30 percent.

This map unit makes up about 17 percent of the two-county survey area. Callahan soils make up about 35 percent of the unit, Throck soils about 30 percent, Bonti soils about 20 percent, and other soils about 15 percent.

The gently sloping to sloping Callahan soils are moderately deep. They are on side slopes. Slopes are 1 to 8 percent. Typically, the surface layer is neutral, brown loam about 4 inches thick. The subsoil to a depth of 38 inches is moderately alkaline, reddish brown and brown clay. The underlying material to a depth of 65 inches is moderately alkaline, light olive brown shaly clay.

The gently sloping to hilly Throck soils are deep. They are on side slopes. Slopes are 1 to 30 percent. Typically, the surface layer is moderately alkaline, grayish brown stony clay loam about 8 inches thick. The subsoil to a depth of 32 inches is moderately alkaline, light yellowish brown clay. The underlying material to a depth of 60 inches is light yellowish brown shaly clay.

The gently sloping to sloping Bonti soils are moderately deep. They are on ridgetops. Slopes are 1 to 8 percent. Typically, the surface layer is neutral, brown stony fine sandy loam or fine sandy loam about 11 inches thick. A few sandstone boulders are on the surface. The subsoil to a depth of 38 inches is medium acid clay loam that is reddish brown in the upper part and reddish yellow in the lower part. Below that is strongly cemented sandstone.

Other soils are the Leeray, Menard, Nukrum, Pedernales, Rochelle, and Winters soils. The deep, clayey, gently sloping Leeray and Nukrum soils are on uplands. The deep, loamy, gently sloping to sloping Menard and Pedernales soils are on uplands. The deep, loamy, gently sloping Rochelle and Winters soils are on upland terraces.

Most of the soils in this map unit are too steep and stony for cultivation. They are better suited to use as rangeland. Much of the area is in native post oak trees. A few cultivated fields are used for oats, wheat, and forage sorghum.

These soils have medium potential for rangeland. They have medium potential for pastureland because of stoniness and slope. Potential for most urban uses is medium. These soils have low potential for septic tank absorption fields because of moderately slow to very slow permeability in the subsoil. The clayey lower layers also shrink and swell with changes in moisture, which adversely affects streets and roads and foundations of dwellings. Potential for recreational uses is medium because of stoniness and slope.

2. Bolar-Brackett

Gently sloping to hilly, shallow to moderately deep, gravelly, loamy soils over limestone

This map unit is made up of gently sloping to steep soils on uplands. Slopes are 1 to 30 percent.

This map unit makes up about 16 percent of the two-county survey area. Bolar soils make up about 33 percent of the unit, Brackett soils about 17 percent, and other soils about 50 percent.

The gently sloping to sloping Bolar soils are moderately deep. They are on ridgetops and on benches on hillsides. Slopes are 1 to 8 percent. Typically, the surface layer is moderately alkaline, dark grayish brown clay loam about 12 inches thick. The subsoil to a depth of 30 inches is moderately alkaline, brown and pale brown clay loam. Below that is limestone bedrock.

Brackett soils are shallow. They are on ridgetops and hillsides. Slopes are 1 to 30 percent. Typically, the surface layer is moderately alkaline, grayish brown gravelly loam about 5 inches thick. Limestone fragments, 1 to 7 inches across, cover 30 percent of the surface. The subsoil to a depth of 17 inches is moderately alkaline, light brownish gray gravelly loam. Below a depth of 17 inches is pale yellow, thinly bedded, weakly cemented limestone and calcareous earth.

Other soils are the Hext, Real, Sunev, and Tarrant soils. The moderately deep, loamy, gently sloping to sloping Hext soils are on uplands. The shallow, gravelly Real and Tarrant soils are on ridgetops and knolls. The deep, loamy, gently sloping Sunev soils are in valleys.

The soils in this map unit are mainly used as rangeland. Much of the area is open prairie, but some areas are covered with brushy live oak motts. A few small fields are used for oats, forage sorghum, or Coastal bermudagrass (fig. 2).

The potential for rangeland is medium. It is low for pastureland and cropland because of a restricted root zone, stoniness, and slope. Potential for most urban uses is medium, mainly because of the shallow or moderate depth to rock or because the soils shrink and swell with changes in moisture. Potential for recreational uses is medium because of stoniness and slope.

3. Tarrant-Tarpley

Gently sloping to hilly, very shallow to shallow, cobbly and stony, clayey and loamy soils over limestone

This map unit is made up of gently sloping to hilly soils on uplands. Slopes are 1 to 30 percent.

This map unit makes up about 12 percent of the two-county survey area. Tarrant soils make up about 29 percent of the unit, Tarpley soils about 22 percent, and other soils about 49 percent.

The Tarrant soils are very shallow to shallow. They are on knolls and outer edges of ridgetops. Typically, the surface layer is moderately alkaline cobbly clay about 15 inches thick. It is very dark grayish brown in the upper 8

Figure 2.—Area of Bolar-Brackett association, undulating, that has been cleared and planted to kleingrass.

inches and dark grayish brown in the lower 7 inches. Below this is light brownish gray, hard limestone.

The gently sloping Tarpley soils are shallow. They are on plateaus and ridgetops. Slopes are mainly 1 to 8 percent. Typically, the surface layer is neutral, very dark grayish brown stony clay loam about 7 inches thick. The subsoil to a depth of 18 inches is neutral, reddish brown clay. Below this is pale yellow, hard limestone bedrock.

Other soils are the Bolar, Caradan, Denton, Krum, and Real soils. The moderately deep, loamy, gently sloping to sloping Bolar soils are on uplands. The deep and moderately deep, gently sloping, clayey Caradan and Denton soils are on uplands. The deep, clayey, gently sloping Krum soils are on bottoms of drainageways and outwash fans. The shallow, loamy, gently sloping to hilly Real soils are on ridgetops and side slopes.

The soils in this map unit are mainly used as rangeland. The vegetation is a cover of grasses, forbs, and brush. There are scattered post oak and Spanish oak trees and live oak motts. Low-growing shinnery oak is prevalent, especially on the gently sloping plateaus. A few areas that are not too shallow or too stony are used for small grain, forage sorghum, or Coastal bermudagrass.

Potential for rangeland is medium. Yields of mid and tall grasses are good during favorable years. Potential for cropland and pastureland is low because of a restricted root zone and stones. Potential for most urban uses is low because of the very shallow or shallow depth to rock and because the soils shrink and swell with changes in moisture. Potential for most recreational uses is low because of large stones and the high content of clay in the surface layer.

4. Doudle-Real

Gently sloping to hilly, shallow to moderately deep, gravelly and cobbly, loamy soils over limestone and loamy sediment

This map unit is in areas of gently sloping to hilly uplands. Slopes are 1 to 30 percent.

This map unit makes up about 11 percent of the two-county survey area. Doudle soils make up about 43 percent of the unit, Real soils about 25 percent, and other soils about 32 percent.

The gently sloping to sloping Doudle soils are moderately deep. They are mainly on side slopes. Slopes are 1 to 8 percent. These soils are moderately alkaline throughout. Typically, the surface layer is brown cobbly loam about 6 inches thick. The subsoil to a depth of 13 inches is light brown loam that contains accumulations of calcium carbonate, and to a depth of 36 inches it is pink silt loam. Below that is stratified sandstone and silt loam.

The gently sloping to moderately steep Real soils are shallow. They are on ridgetops and hillsides. Typically, the surface layer is moderately alkaline, brownish gravelly clay loam and very gravelly clay loam about 11 inches thick. Below that is weakly cemented limestone.

Other soils are the Bosque, Brackett, Frio, Nukrum, Menard, Mereta, Pedernales, and Sunev soils. The deep, loamy, nearly level Bosque and Frio soils are on narrow flood plains. The shallow, loamy, sloping to moderately steep Brackett soils are on hillsides. The shallow, loamy, gently sloping Mereta soils are on ridgetops. The deep, clayey, gently sloping Nukrum soils are on foot slopes. The deep, loamy, gently sloping Menard, Pedernales, and Sunev soils are on uplands.

The soils in this map unit are mainly used for rangeland and wildlife habitat. The vegetation is a cover of grasses, forbs, shrubs, and live oak trees. A few areas that are not too shallow or too stony are used for oats, forage sorghum, or Coastal bermudagrass.

Potential for rangeland is medium. Yields of mid and tall grasses are good during favorable years. Potential for cropland and pastureland is low because of a restricted root zone and stones. Potential for most urban uses is medium because of depth to rock. Potential for most recreational uses is medium because of small stones. Wildlife, especially deer, turkey, quail, and various predators are abundant throughout areas of this map unit. Most areas are managed for hunting.

5. Speck-Tarrant

Gently sloping, shallow to very shallow, stony, loamy and clayey soils over limestone

This map unit is made up of gently sloping soils on uplands. Slopes are 1 to 5 percent.

This map unit makes up about 9 percent of the two-county survey area. Speck soils make up about 40 percent of the unit, Tarrant soils about 20 percent, and other soils about 40 percent.

The gently sloping Speck soils are shallow. They are mainly on plateaus and ridges. Slopes are 1 to 5 percent. Typically, the surface layer is neutral, brown stony clay loam about 7 inches thick. The subsoil is neutral, reddish brown clay to a depth of about 15 inches. Below this is very pale brown hard limestone bedrock.

The gently sloping Tarrant soils are very shallow or shallow. They are mainly on plateaus and ridges. Slopes are 1 to 5 percent. Typically, the surface layer is moderately alkaline cobbly clay about 15 inches thick that is very dark grayish brown in the upper 8 inches and dark grayish brown in the lower 7 inches. Below the surface layer is light brownish gray hard limestone bedrock.

Other soils are the Kavett, Leeray, Lindy, Nukrum, Nuvalde, and Throck soils. The shallow, clayey, gently sloping Kavett soils and the deep, clayey, gently sloping Leeray and Nukrum soils are on uplands. The deep and moderately deep, loamy, gently sloping Lindy and Nuvalde soils are on uplands and terraces. The moderately deep, loamy, sloping to strongly sloping Throck soils are on hillsides.

The soils in this map unit are mainly used for rangeland. Live oak motts, elm trees, and various shrubs grow in most areas. A few areas that are not too shallow or too stony are used for small grain, forage sorghum, or Coastal bermudagrass.

Potential for rangeland is medium because of the restricted rooting depth. Potential for cropland and pastureland is low because of stones and the restricted rooting depth. Potential for most urban uses is low because of the shallow to very shallow depth to rock and because of shrinking and swelling of the soils with changes in moisture. Potential for most recreational uses is low because of large stones and the high content of clay in the surface layer.

Deep, loamy and clayey soils on flood plains and uplands

This group of map units makes up about 10 percent of the survey area. Most of the soils in these units are suited to cultivation, pastureland, or rangeland. Some areas are flood irrigated. Some areas are better suited to rangeland or wildlife habitat because of frequent flooding.

6. Frio-Sunev-Winters

Nearly level to gently sloping, deep, loamy soils over loamy and clayey alluvium

This map unit is made up of nearly level soils on flood plains and nearly level to gently sloping soils on uplands. Slopes are 0 to 5 percent.

This map unit makes up about 8 percent of the two-county survey area. Frio soils make up about 45 percent of the unit, Sunev soils about 25 percent, Winters soils about 15 percent, and other soils about 15 percent.

The nearly level Frio soils are on flood plains that are occasionally to frequently flooded. Slopes are 0 to 1 percent. These soils are moderately alkaline throughout. Typically, the surface layer is brown silty clay loam to a depth of 7 inches and dark brown to brown silty clay to a depth of 34 inches. Below that, the underlying material to a depth of 72 inches is yellowish brown silty clay.

The gently sloping Sunev soils are on foot slopes and in shallow valleys on uplands. Slopes are 1 to 3 percent. These soils are moderately alkaline throughout. Typically, the surface layer is dark grayish brown clay loam about 18 inches thick. The subsoil to a depth of 32 inches is pale brown clay loam. The underlying material to a depth of 80 inches is very pale brown and yellow loam.

The nearly level to gently sloping Winters soils are on plains and in valleys on uplands. Slopes are 0 to 5 percent. Typically, the surface layer is neutral, reddish brown fine sandy loam about 6 inches thick. The subsoil to a depth of 65 inches is moderately alkaline clay loam and clay that is reddish brown in the upper part and yellowish red and reddish yellow in the lower part. The underlying material is moderately alkaline, yellowish red clay loam to a depth of 80 inches.

Other soils are the Deleon, Krum, Nukrum, and Sagerton soils. The deep, clayey, nearly level Deleon soils are on flood plains. The deep, clayey, gently sloping Nukrum and Krum soils are in valleys or outwash fans. The deep, loamy, nearly level to gently sloping Sagerton soils are in valleys.

Most of the soils in this map unit are used for cropland and pastureland. Potential for cultivated crops is high. Oats, wheat, forage sorghum, and grain sorghum are the main crops. Potential for pastureland and rangeland is high. Yields of Coastal bermudagrass and kleingrass are very good during favorable years. Some areas are irrigated.

Potential for urban uses is low because of the hazard of flooding. Potential for most recreational uses is medium.

7. Weswood-Clairemont

Nearly level, deep, loamy soils over loamy alluvium

This map unit is made up of nearly level soils on flood plains. Slopes are 0 to 1 percent.

This map unit makes up about 2 percent of the two-county survey area. Weswood soils make up about 27 percent of the unit, Clairemont soils about 23 percent, and other soils about 50 percent.

The nearly level Weswood soils are on flood plains that are occasionally flooded. Slopes are 0 to 1 percent. These soils are moderately alkaline throughout. Typically, the surface layer is reddish brown silt loam about 8 inches thick. The subsoil to a depth of 42 inches is reddish brown silt loam. The underlying material to a depth of 80 inches is reddish yellow silt loam stratified with fine sandy loam and silty clay loam.

The nearly level Clairemont soils are on flood plains that are frequently flooded. Slopes are 0 to 1 percent. These soils are moderately alkaline throughout. Typically, the surface layer is reddish brown silt loam about 14 inches thick. The underlying material to a depth of 62 inches is reddish brown and light reddish brown silt loam stratified with fine sandy loam.

Other soils are the Bastrop, Miller, and Winters soils. The deep, clayey, nearly level Miller soils are on flood plains. The deep, loamy, nearly level to gently sloping Bastrop and Winters soils are on upland terraces.

Most of the soils in this map unit are used as cropland and pastureland. Potential is high for pastureland and rangeland. Areas that flood only occasionally have high potential for cultivated crops. Potential for urban uses is low because of the hazard of flooding. Potential for most recreational uses is medium.

Moderately deep and deep, loamy and clayey soils on uplands

This group of map units makes up about 21 percent of the two-county survey area. The soils are dominantly deep to moderately deep and range from nearly level to sloping. Slopes range from 0 to 8 percent but mainly are 0 to 5 percent. Most of the soils in this group are well suited to cultivation, rangeland, or wildlife habitat.

8. Pedernales-Menard-Hext

Gently sloping to sloping, moderately deep to deep, loamy soils over loamy sediment

This map unit is made up of gently sloping to sloping soils on uplands. Slopes are 1 to 8 percent.

This map unit makes up about 7 percent of the two-county survey area. Pedernales soils make up about 35 percent of the unit, Menard soils about 30 percent, Hext soils about 20 percent, and other soils about 15 percent.

The gently sloping Pedernales soils are deep. Slopes are 1 to 5 percent. Typically, the surface layer is neutral, brown fine sandy loam about 14 inches thick. The subsoil to a depth of 37 inches is mildly alkaline to moderately alkaline, reddish brown sandy clay and clay. The underlying material to a depth of 60 inches is moderately alkaline, reddish yellow sandy clay loam.

The gently sloping to sloping Menard soils are deep. Slopes are 1 to 8 percent. Typically, the surface layer is neutral, brown fine sandy loam about 6 inches thick. The subsoil to a depth of 36 inches is neutral to moderately alkaline, reddish brown to strong brown sandy clay loam. The underlying material to a depth of 60 inches is moderately alkaline, yellowish red sandy clay loam.

The gently sloping to sloping Hext soils are moderately deep. Slopes are 1 to 8 percent. Typically, the surface layer and subsoil are moderately alkaline, brown loam to a depth of 24 inches. Below that is weakly cemented siltstone stratified with light reddish brown loam.

Other soils are the Bosque, Cisco, Energy, May, and Rochelle soils. The deep, loamy, nearly level Bosque and Energy soils are on flood plains. The deep, loamy, gently sloping Cisco and May soils are on uplands. The moderately deep, loamy, gently sloping Rochelle soils are on upland terraces.

The soils in this map unit are used for cultivated crops, pastureland, and rangeland. Potential for rangeland, pastureland, and cultivated crops is medium. Potential for most urban uses is medium. The lower layers of these

soils shrink and swell with changes in moisture, which adversely affects streets and roads and foundations of dwellings. Potential for recreational uses is high.

9. Leeray-Sagerton-Nukrum

Nearly level to gently sloping, deep, loamy and clayey soils over clayey or loamy sediment

This map unit is made up of nearly level to gently sloping soils on uplands. Slopes are 0 to 4 percent.

This map unit makes up about 7 percent of the two-county survey area. Leeray soils make up about 35 percent of the unit, Sagerton soils about 25 percent, Nukrum soils about 20 percent, and other soils about 20 percent.

The nearly level to gently sloping Leeray soils are on plains and in valleys. Slopes are 0 to 3 percent. These soils are moderately alkaline throughout. Typically, the surface layer is dark grayish brown clay to a depth of about 26 inches and brown clay to a depth of 48 inches. The underlying material to a depth of 56 inches is brownish yellow clay.

The nearly level to gently sloping Sagerton soils are on plains and in valleys. Slopes are 0 to 3 percent. Typically, the surface layer is neutral, dark brown clay loam about 6 inches thick. The subsoil to a depth of 39 inches is mildly alkaline and moderately alkaline, reddish brown and brown clay, and to a depth of 80 inches it is moderately alkaline, reddish yellow clay loam.

The gently sloping Nukrum soils are on terraces that are mainly in valleys. Slopes are 1 to 4 percent. These soils are moderately alkaline throughout. Typically, the surface layer is dark grayish brown silty clay about 24 inches thick. The subsoil to a depth of 56 inches is grayish brown silty clay. The underlying material to a depth of 72 inches is moderately alkaline, brown silty clay loam.

Other soils are the Abilene, Frio, Nuvalde, Rowena, and Winters soils. The deep, loamy, nearly level Frio soils are on flood plains. The deep, loamy, nearly level to gently sloping Abilene, Nuvalde, Rowena, and Winters soils are on uplands.

The soils in this map unit are used for cropland, pastureland, and rangeland. Potential for cultivated crops and introduced pasture grasses is high. Wheat, forage sorghum, and grain sorghum are the main cultivated crops. Potential for rangeland is medium.

Potential for most urban uses is low. The clayey layers of the soils in this unit shrink and swell with changes in moisture, which adversely affects streets and roads and foundations of dwellings. The very slow and moderately slow permeability of the subsoil commonly causes septic tank systems to fail during rainy seasons. Potential for recreational uses is medium because of the high content of clay in the surface layer.

10. Krum-Bolar-Denton

Gently sloping, moderately deep to deep, clayey and loamy soils over limestone or clayey sediment

This map unit is made up of gently sloping soils on uplands. Slopes are 1 to 5 percent.

This map unit makes up about 6 percent of the two-county survey area. Krum soils make up about 35 percent of the unit, Bolar soils about 18 percent, Denton soils about 9 percent, and other soils about 38 percent.

The gently sloping Krum soils are deep. They are on side slopes of terraces that are mainly in shallow valleys. Slopes are 1 to 3 percent. These soils are moderately alkaline throughout. Typically, the surface layer is very dark grayish brown and dark grayish brown silty clay about 34 inches thick. The subsoil to a depth of 67 inches is yellowish brown silty clay.

The gently sloping Bolar soils are moderately deep. They are mainly along limestone ridges. Slopes are 2 to 5 percent. These soils are moderately alkaline throughout. Typically, the surface layer is dark grayish brown clay loam about 12 inches thick. The subsoil to a depth of 30 inches is brown and pale brown clay loam. Below that is strongly fractured limestone bedrock that is interbedded with clayey marl.

The gently sloping Denton soils are moderately deep. They are along limestone ridges. Slopes are 1 to 3 percent. Typically, the surface layer is moderately alkaline, very dark grayish brown and brown silty clay about 28 inches thick. Below that is strongly cemented fractured limestone.

Other soils are the Caradan, Frio, Leeray, Sunev, and Tarpley soils. The deep, loamy, nearly level Frio soils are on flood plains. The loamy, moderately deep, gently sloping Caradan soils and the shallow, gently sloping Tarpley soils are on uplands; slopes are 1 to 3 percent. The deep, clayey, gently sloping Leeray soils are on uplands. The deep, loamy Sunev soils are in valleys; slopes are 1 to 3 percent.

The soils in this map unit are used for cropland, pastureland, and rangeland. Potential is high for cultivated crops and introduced pasture grasses. Where these soils are cultivated, oats, forage sorghum, and grain sorghum are the main crops. Potential for rangeland is also high.

Potential for most urban uses is low. The clayey layers in these soils shrink and swell with changes in moisture, which adversely affects streets and roads and foundations of dwellings. The moderately slow and slow permeability in the subsoil of the Krum and Denton soils commonly causes septic tank systems to fail during rainy seasons. Potential for recreational uses is medium because of the high content of clay in the surface layer.

11. Bastrop-Winters-Sagerton

Nearly level to gently sloping, deep, loamy soils over loamy sediment

This map unit is made up of nearly level to gently sloping soils on upland terraces. Slopes are 0 to 5 percent.

This map unit makes up about 1 percent of the two-county survey area. Bastrop soils make up about 35

percent of the unit, Winters soils about 30 percent, Sagerton soils about 20 percent, and other soils about 15 percent.

The gently sloping Bastrop soils are on high upland terraces. Slopes are 1 to 3 percent. Typically, the surface layer is brown and light yellowish brown, slightly acid fine sandy loam about 18 inches thick. The subsoil to a depth of 80 inches is yellowish red sandy clay loam. It is neutral to a depth of 48 inches and moderately alkaline below that.

The nearly level to gently sloping Winters soils are on terraces on uplands and in valleys. Slopes are 0 to 5 percent. Typically, the surface layer is neutral, reddish brown fine sandy loam about 6 inches thick. The subsoil to a depth of 65 inches is moderately alkaline clay loam and clay that is reddish brown in the upper part and yellowish red and reddish yellow in the lower part. The underlying material to a depth of 80 inches is moderately alkaline, yellowish red clay loam.

The nearly level to gently sloping Sagerton soils are on terraces on upland plains and in valleys. Slopes are 0 to 3 percent. Typically, the surface layer is neutral, dark brown clay loam about 6 inches thick. The subsoil is mildly alkaline and moderately alkaline, reddish brown and brown clay to a depth of 39 inches and moderately alkaline, reddish yellow clay loam to a depth of 80 inches.

Other soils are the Abilene, Desan, Frio, Rowena, and Weswood soils. The deep, loamy Abilene and Rowena soils are on concave parts of upland terraces; slopes are 0 to 3 percent. The deep, loamy, nearly level Frio and Weswood soils are on flood plains. The deep, sandy, gently sloping Desan soils are on uplands.

Most of the soils in this map unit are used as cropland and pastureland.

Potential for cultivated crops is high. Oats, wheat, forage sorghum, and grain sorghum are the main crops. Potential for rangeland and pastureland grasses is also high. Yields of Coastal bermudagrass and kleingrass are good during favorable years.

Potential for most urban uses is medium because the soils shrink and swell with changes in moisture. Potential for recreational uses is high.

Deep, sandy and loamy soils on uplands

This map unit makes up about 4 percent of the survey area. Most of the soils are suited to cultivation, but because of the sandy and loamy texture of the surface layer, they may be eroded by wind unless they are protected.

12. Pedernales-Nimrod-Chaney

Nearly level to gently sloping, deep, sandy and loamy soils over loamy sediment or soft sandstone

This map unit is made up of nearly level to gently sloping soils on uplands. Slopes are 0 to 5 percent.

This map unit makes up about 4 percent of the survey area. Pedernales soils make up about 45 percent of the unit, Nimrod soils about 15 percent, Chaney soils about 8 percent, and other soils about 32 percent.

The gently sloping Pedernales soils are on uplands. Slopes are 1 to 5 percent. Typically, the surface layer is neutral, brown fine sandy loam about 14 inches thick. The subsoil to a depth of about 37 inches is mildly alkaline or moderately alkaline, reddish brown sandy clay and clay. The underlying material to a depth of 60 inches is moderately alkaline, reddish yellow sandy clay loam.

The nearly level to gently sloping Nimrod soils are on uplands. Slopes are 0 to 5 percent. Typically, the surface layer is slightly acid, pale brown and very pale brown fine sand about 30 inches thick. The subsoil to a depth of 66 inches is medium acid, grayish and yellowish sandy clay loam that is coarsely mottled with brown and red. The underlying material to a depth of 80 inches is medium acid, light brownish gray fine sandy loam that has common coarse red mottles.

The gently sloping Chaney soils are on uplands. Slopes are 1 to 5 percent. Typically, the surface layer is slightly acid, brown and very pale brown loamy fine sand about 18 inches thick. The subsoil to a depth of 44 inches is medium acid, brownish yellow sandy clay. The underlying material to a depth of 60 inches is slightly acid, light gray sandy clay.

Other soils are the Cisco, May, Patilo, and Winters soils. The deep, loamy and sandy, gently sloping Cisco soils are on uplands. The deep, loamy, nearly level to gently sloping May and Winters soils are on upland terraces. The deep, sandy, gently sloping Patilo soils are on uplands.

Most of the soils in this map unit are used as cropland and pastureland.

Potential for most cultivated crops is high. Peanuts, forage sorghum, and grain sorghum are the main crops. Potential for rangeland and pastureland grasses is also high. Yields of Coastal bermudagrass and lovegrass are good during favorable years. Some areas are irrigated.

Potential for most urban uses is medium. The clayey lower layers of these soils shrink and swell with changes in moisture, which adversely affects streets and roads and foundations of dwellings. The moderately slow and slow permeability of the subsoil commonly causes septic tank systems to fail during rainy seasons. Potential for recreational uses is medium because of the sandy surface layer.

Broad land use considerations

The kinds of land uses considered in the survey area are cropland, rangeland, pastureland, urban land, and recreational areas. Cultivated crops grown extensively are oats, wheat, grain sorghum, and peanuts. Rangeland refers to land that supports native species of plants. Pastureland refers to land that supports improved

grasses, such as Coastal bermudagrass. Urban land includes residential, commercial, and industrial land uses. Recreational areas, for example, are nature study trails and camping and picnic sites.

In the Frio-Sunev-Winters, Weswood-Clairemont, Leeray-Sagerton-Nukrum, and Krum-Bolar-Denton map units, the soils have high potential for farming but low potential for nonfarm uses. In these map units the dominant soils are Leeray, Krum, Frio, and Weswood. Flooding or high shrink-swell potential are the main limitations for nonfarm uses.

Most of the soils in the survey area have medium or high potential for pastureland and rangeland. The gently sloping to hilly soils of the Bolar-Brackett, Tarrant-Tarpley, Doudle-Real, and Speck-Tarrant map units are gravelly, cobbly, or stony and are very shallow to moderately deep over bedrock. These characteristics limit the development and management of improved pasture.

Each year a considerable amount of land is developed for urban uses in Brownwood, Early, Bangs, and other towns in the survey area. About 26,582 acres was urban or built-up land in 1967, according to the Conservation Needs Inventory (*4*). Much of this acreage was suitable for cropland. Data about specific soils in this soil survey can be helpful in planning future land use patterns.

Most of the soils in the survey area are favorable for urban development; however, the soils in the Weswood-Clairemont map unit and part of the Frio-Sunev-Winters map unit are on flood plains, and flooding is a severe limitation. Urban development is costly on soils that have hard bedrock just below the surface, such as soils in the Speck-Tarrant and Tarrant-Tarpley map units. The clayey soils of the Leeray-Sagerton-Nukrum map unit have low potential for urban development because of the high shrink-swell potential.

The soils in the Pedernales-Menard-Hext and Bastrop-Winters-Sagerton map units have high potential for recreational uses. Live oak and post oak trees on the soils in the Doudle-Real, Pedernales-Menard-Hext, and Speck-Tarrant map units enhance the beauty in much of the survey area. These map units also serve as habitat for many important wildlife species. Potential for wildlife is also discussed in the section "Use and management of soils."

Soils information can be used as a guide in planning the orderly growth and development of a county. It is especially helpful in determining which lands to allocate to each use.

Soil maps for detailed planning

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and management of the soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil, a brief description of the soil profile, and a listing of the principal hazards and limitations to be considered in planning management.

This survey has both narrowly defined and broadly defined units. Broadly defined units are more variable in composition than other units but can be interpreted for the expected uses of the soils. They are indicated by a footnote on the soil legend at the back of this publication.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying material, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Abilene clay loam, 0 to 1 percent slopes, is one of several phases in the Abilene series.

Some map units are made up of two or more major soils. These map units are called soil complexes, soil associations, or undifferentiated groups.

A *soil complex* consists of two or more soils in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Hext-Brackett complex, 1 to 8 percent slopes, is an example.

A *soil association* is made up of two or more geographically associated soils that are shown as one unit on the maps. Because of present or anticipated soil uses in the survey area, it was not considered practical or necessary to map the soils separately. The pattern and relative proportion of the soils are somewhat similar. Doudle-Real association, undulating, is an example.

An *undifferentiated group* is made up of two or more soils that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils in a mapped area are not uniform. An area can be made up of only one of the major soils, or it can be made up of all of them. Clairemont soils, frequently flooded, is an undifferentiated group in this survey area.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some

of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

Table 5 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

1—Abilene clay loam, 0 to 1 percent slopes. This deep, nearly level soil is on plains and in shallow valleys on uplands. Slopes are smooth and slightly concave to plane. Areas are oblong to irregular in shape and range from 10 to 200 acres.

Typically, the surface layer is firm, moderately alkaline, dark grayish brown clay loam about 7 inches thick. The subsoil extends to a depth of about 31 inches. It is very firm, moderately alkaline, dark brown clay to a depth of 24 inches. Below that, it is very firm, moderately alkaline, brown clay loam. The underlying material to a depth of 64 inches is firm, moderately alkaline, light yellowish brown and very pale brown clay loam and clay.

This soil is well drained. Surface runoff is very slow. Permeability is moderately slow, and available water capacity is high.

Included in some areas of this soil are small areas of Sagerton and Rowena soils. Also included are areas in which the subsoil extends to a depth of more than 60 inches. These included soils make up about 20 percent of any mapped area.

This soil is mainly used as cropland or for improved pasture. Oats, wheat, and forage sorghums are the main crops, but other crops are grown.

Potential for wheat, oats, grain sorghum, forage sorghum, and cotton is high. Crop residue left on or near the surface of the soil helps to conserve moisture and maintain tilth and productivity.

Potential is high for pasture production. Improved grasses such as kleingrass, Coastal bermudagrass, King Ranch bluestem, and weeping lovegrass are well suited to this soil.

Potential for native range plants is medium. The climax plant community consists mainly of mid grasses. Management needs are proper stocking, controlled grazing, and brush management. Potential for wildlife habitat is medium.

Potential for most urban or recreational uses is medium. Shrinking and swelling of the soil with changes in moisture, high corrosivity to uncoated steel, and the high content of clay in the surface layer are the main limitations.

This soil is in capability subclass IIc and the Clay Loam range site.

2—Abilene clay loam, 1 to 3 percent slopes. This deep, gently sloping soil is on plains and in shallow valleys on uplands. Slopes are smooth and slightly concave to plane. Areas are oblong to irregular in shape and range from 10 to 200 acres.

Typically, the surface layer is firm, mildly alkaline, very dark grayish brown clay loam about 10 inches thick. The subsoil extends to a depth of 42 inches. It is firm, mildly alkaline clay that is very dark grayish brown to a depth of 16 inches and brown below 16 inches. It contains accumulations of calcium carbonate below a depth of 24 inches. The underlying material to a depth of 64 inches is firm, moderately alkaline, very pale brown clay.

This soil is well drained. Surface runoff is slow. Permeability is moderately slow, and available water capacity is high.

Included in some areas of this soil are areas of Rowena and Sagerton soils. Also included are areas in which the subsoil extends to a depth of more than 60 inches. These included soils make up about 20 percent of any mapped area.

This soil is mainly used for cropland or improved pasture. Oats, wheat, and forage sorghums are the main crops, but other crops are grown.

Potential is high for oats and wheat and medium for grain sorghum, forage sorghum, and cotton. Terraces and contour farming help to control erosion. Crop residue left on or near the surface of the soil helps to conserve moisture and maintain tilth and productivity.

This soil has medium potential for pasture production. Improved grasses such as kleingrass, Coastal bermudagrass, King Ranch bluestem, and weeping lovegrass are suited to this soil.

Potential for native range plants is medium. The climax plant community consists mainly of mid grasses. Management needs are proper stocking, controlled grazing, and brush management. Potential for wildlife habitat is medium.

Potential for most urban or recreational uses is medium. Shrinking and swelling of the soil with changes in moisture, high corrosivity to uncoated steel, and the high content of clay in the surface layer are the main limitations.

This soil is in capability subclass IIe and the Clay Loam range site.

3—Abilene-Urban land complex, 0 to 2 percent slopes. This nearly level to gently sloping complex is on upland terraces mainly in valley positions. Areas are oblong to irregular in shape and range from 20 to 400 acres.

Abilene soils make up about 35 percent of the complex, Urban land about 40 percent, and other soils about 25 percent. The soils and the Urban land are so intricately mixed that it is not practical to map them separately.

Undisturbed areas of Abilene soils typically have a surface layer that is firm, moderately alkaline, dark gray-

ish brown clay loam about 12 inches thick. The subsoil extends to a depth of 57 inches. It is very firm, moderately alkaline clay that is dark grayish brown to a depth of 18 inches, brown to a depth of 33 inches, and light brown below 33 inches. The underlying material to a depth of 80 inches is firm, reddish brown clay loam.

Abilene soils are deep and well drained. Surface runoff is slow. Permeability is moderately slow, and available water capacity is high.

Urban land consists mostly of streets, parking areas, houses, and buildings. Parts of the Urban land are in the Camp Bowie area and consist of remnants of abandoned streets and building foundations and spots that have 6 to 10 inches of gravel or caliche material. Much of this area has been altered by grading and shaping.

Included in this complex in mapping are areas of Sagerton and Rowena soils. Areas of these soils range from small spots about 20 feet across to about 10 acres. They are rounded to irregular in shape and are intermixed in the mapped area.

Potential for most urban uses is medium. Shrinking and swelling of the soil with changes in moisture and high corrosivity to uncoated steel are the main limitations. These limitations can be overcome by good design and careful installation procedures. The moderately slow permeability in the subsoil limits its use for septic tank absorption fields. Potential for recreational uses is also medium. The high content of clay in the surface layer and the moderately slow permeability are the most restrictive features.

This complex is not placed in a capability sublcass or range site.

4—Bastrop fine sandy loam, 1 to 3 percent slopes. This deep, gently sloping soil is on old, high terraces on uplands. Slopes are smooth and plane to slightly convex. Areas are oblong to irregular in shape and range from 20 to several hundred acres.

Typically, the surface layer is friable, slightly acid, fine sandy loam about 18 inches thick. It is brown in the upper 8 inches and light reddish brown in the lower 10 inches. The subsoil extends to a depth of 80 inches. It is firm, yellowish red sandy clay loam that is neutral to a depth of 48 inches and moderately alkaline below 48 inches.

This soil is well drained. Surface runoff is medium. Permeability is moderate, and available water capacity is high. This soil has good tilth and can be worked throughout a wide range of moisture conditions.

Included in some areas of this soil are small areas of Sagerton, Winters, Desan, and Heaton soils. Also included are soils that are similar to this Bastrop soil but have free carbonates at a depth between 36 and 60 inches. A few areas have slopes of less than 1 percent. These included soils make up less than 20 percent of any mapped area.

This soil is mainly used as cropland. Potential for oats and grain sorghum is high. Terraces and contour farming help control erosion. Crop residue left on or near the surface helps to conserve moisture and maintain tilth and productivity.

Potential for pasture production is high. Improved grasses such as weeping lovegrass, Coastal bermudagrass, and kleingrass are well suited to this soil. Potential is high for the use of this soil as rangeland. Potential is high for most urban or recreational uses. Slope is a limitation to the use of this soil for playgrounds.

This soil is in capability subclass IIe and the Sandy Loam range site.

5—Bolar clay loam, 2 to 5 percent slopes. This moderately deep, gently sloping soil is on uplands, mainly along limestone ridges. Slopes are slightly convex. Areas are irregular in shape and are generally less than 40 acres.

Typically, the surface layer is moderately alkaline, dark grayish brown clay loam about 12 inches thick. It is friable in the upper 6 inches and firm in the lower part. The subsoil extends to a depth of 30 inches. It is firm, moderately alkaline, brown clay loam to a depth of 19 inches and friable, moderately alkaline, pale brown clay loam below 19 inches. Strongly cemented limestone that is fractured and interbedded with calcareous clayey marl is at a depth of 30 inches.

This soil is well drained. Surface runoff is medium, and permeability is moderate. Available water capacity is low.

Included in some areas of this soil are small areas of Brackett, Denton, Hext, Mereta, and Sunev soils. These included soils make up less than 30 percent of any mapped area.

This soil can be cultivated but is mainly used as rangeland. Potential for native range plants is high. The climax plant community is a mixture of tall and mid grasses, forbs, and a few motts of live oak trees. Management needs are proper stocking, controlled grazing, and brush management. Potential for wildlife habitat is medium.

Potential for wheat, oats, and grain sorghum is medium. Keeping crop residue on or near the soil surface helps to prevent erosion and conserve moisture. It also helps to improve soil tilth and water intake. Contour farming and terraces are needed in most areas to control erosion. When cuts or excavations exceed a depth of 20 to 40 inches, there is a hazard of cutting into a bed of strongly cemented limestone.

Potential for pasture production is medium. Improved grasses such as kleingrass, weeping lovegrass, and Coastal bermudagrass are suited to this soil.

Potential for most urban uses is medium. The moderate depth to rock and shrinking and swelling of the soil with changes in moisture restrict some uses. Potential for most recreational uses is medium because of the high content of clay in the surface layer.

This soil is in capability subclass IIIe and the Clay Loam range site.

6—Bolar-Brackett association, undulating. This association consists of moderately deep and shallow soils

that are mainly along ridges on uplands. Slopes are 1 to 8 percent, but average about 6 percent. Areas are irregular in shape and range from 50 to several thousand acres.

Bolar soils make up about 33 percent of the association, Brackett soils about 26 percent, and other soils about 41 percent. The composition of this map unit is more variable than that of other map units in the survey area; however, the composition has been controlled well enough so that the map unit can be interpreted for the expected uses of the soils.

Bolar soils are moderately deep and gently sloping. They are on ridgetops that are underlain by limestone. Typically, they have a surface layer that is friable, moderately alkaline clay loam about 14 inches thick that is dark grayish brown in the upper 6 inches and dark brown in the lower 8 inches. A few limestone fragments, 1 to 5 inches across, are on the surface. The subsoil extends to a depth of 29 inches. It is firm, moderately alkaline clay loam that is light yellowish brown to a depth of 22 inches and pale yellow below 22 inches. Interbedded limestone and marl is at a depth of 29 inches.

Bolar soils are well drained. Surface runoff is rapid. Permeability is moderate, and available water capacity is low.

Brackett soils are shallow. They are on short slopes below the ridgetops and on steeper slopes next to drainageways. Typically, they have a surface layer that is friable, moderately alkaline, grayish brown gravelly loam about 5 inches thick. Limestone fragments, 1 to 7 inches across, cover 30 percent of the surface. The subsoil extends to a depth of 17 inches. It is friable, moderately alkaline, light brownish gray gravelly loam that contains concretions and soft fragments of limestone that are generally less than 3 inches across. The underlying material to a depth of 41 inches is pale yellow, thinly bedded, weakly cemented limestone and calcareous earth.

Brackett soils are well drained. Surface runoff is rapid. Permeability is moderately slow, and available water capacity is very low.

Included in this association are small areas of Sunev and Krum soils on foot slopes and Real and Tarrant soils on ridgetops. Also included are small areas of Hext and Menard soils and a soil similar to Bolar soils, except it contains more clay. Small outcrops of limestone are in many areas.

These Bolar and Brackett soils are generally too stony or steep for cultivation. The few areas of arable soils are so small and irregularly shaped that cultivation is impractical. These soils are better suited to native grass.

Potential for native plants is medium. Rapid runoff, medium to very low available water capacity, and restricted rooting depth limit forage production. The climax plant community is a mixture of tall and mid grasses, forbs, and live oak and Texas oak. Management needs are proper stocking, controlled grazing, and brush management. Potential for wildlife habitat is medium.

Potential for most urban or recreational uses is medium. Slope, the high corrosivity to uncoated steel, shrinking and swelling of the soil with changes in moisture, the shallow to moderate depth to bedrock, and the stony or gravelly surface layer of these soils are the main limitations.

Bolar soils are in capability subclass IVe and the Clay Loam range site. Brackett soils are in capability subclass VIs and the Adobe range site.

7—Bonti fine sandy loam, 1 to 3 percent slopes. This moderately deep, gently sloping soil is on uplands, mainly along slightly convex ridges. Slopes are smooth. Areas are irregular in shape and range from 10 to 100 acres or more.

Typically, the surface layer is very friable, neutral fine sandy loam about 16 inches thick. It is brown in the upper 6 inches and light brown in the lower 10 inches. The subsoil extends to a depth of 38 inches. It is firm, medium acid, red clay to a depth of 32 inches and firm, slightly acid, yellowish red sandy clay below 32 inches. Strongly cemented sandstone is at a depth of 38 inches.

This soil is well drained. Surface runoff is medium. Permeability is moderately slow, and available water capacity is low.

Included in some areas of this soil are small areas of soils that are similar to this Bonti soil but are less than 20 inches thick over sandstone and are near the edge of the ridgetops. Also included are small areas of the moderately deep Callahan soils that are underlain by shaly clay and a few areas of Pedernales and Winters soils on foot slopes. These included soils make up less than 20 percent of any mapped area.

This soil can be cultivated but is used mainly for rangeland. Potential for native range plants is medium. The climax plant community is a mixture of tall and mid grasses, forbs, and post oak trees. Management needs are proper stocking, controlled grazing, and brush management. Potential for wildlife habitat is high.

Potential for oats and grain sorghum is medium. Keeping crop residue on or near the surface helps to prevent erosion and conserve moisture. Contour farming and terraces are needed in most areas to control erosion. Where cuts or excavations exceed a depth of 20 to 40 inches, there is a hazard of cutting into the strongly cemented sandstone.

Potential for pasture production is medium. Improved grasses such as kleingrass, weeping lovegrass, King Ranch bluestem, and Coastal bermudagrass are suited to this soil.

Potential for most urban or recreational uses is medium. The moderate depth to rock and shrinking and swelling of the soil with changes in moisture restrict some uses.

This soil is in capability subclass IIe and the Sandy Loam range site.

8—Bonti fine sandy loam, 2 to 5 percent slopes, eroded. This moderately deep, gently sloping soil is on

uplands, mainly along slightly convex ridges. Slopes are smooth. The surface layer has been thinned by sheet erosion, and the subsoil is exposed in shallow crossable gullies. Shallow gully rills and channels are common in each mapped area. Areas are irregular in shape and range from about 10 to 80 acres.

Typically, the surface layer is friable, neutral, reddish brown fine sandy loam about 4 inches thick. The subsoil is very firm, slightly acid, reddish brown clay to a depth of about 26 inches. Below that is hard sandstone.

This soil is well drained. Surface runoff is rapid. Permeability is moderately slow, and available water capacity is low.

Included in some areas of this soil are small areas of soils that are similar to this Bonti soil but are less than 20 inches thick over sandstone and small areas of the moderately deep Callahan soils that are underlain by shaly clay. Also included are small areas that are severely eroded. These included soils make up less than 20 percent of any mapped area.

This soil can be cultivated but is mainly used as rangeland. Potential for native range plants is medium. The climax plant community is a mixture of tall and mid grasses, forbs, and post oak trees. Management needs are proper stocking, controlled grazing, and brush management. Potential for wildlife habitat is high.

Potential for oats and grain sorghum is medium. Keeping crop residue on or near the surface helps to control erosion and conserve moisture. Contour farming and terraces are needed in most areas to control erosion. Where cuts or excavations exceed a depth of 20 to 40 inches, there is a hazard of cutting into strongly cemented sandstone.

Potential for pasture production is medium. Improved grasses such as kleingrass, weeping lovegrass, King Ranch bluestem, and Coastal bermudagrass are suited to this soil.

Potential for most urban or recreational uses is medium. The moderate depth to rock and shrinking and swelling of the soil with changes in moisture restrict some uses.

This soil is in capability subclass IIIe and the Sandy Loam range site.

9—Bonti-Urban land complex, 1 to 5 percent slopes. This gently sloping complex is on uplands, mainly on convex ridges. Areas are irregular in shape and range from 8 to 70 acres.

Bonti soils make up about 60 percent of the complex, Urban land about 20 percent, and other soils about 20 percent. These soils and the Urban land are so intricately mixed, that it is not practical to map them separately.

Undisturbed areas of Bonti soils typically have a surface layer that is friable, neutral, brown fine sandy loam about 7 inches thick. The subsoil to a depth of 33 inches is firm, slightly acid, reddish brown clay. Below that is strongly cemented, yellow sandstone.

Bonti soils are moderately deep and well drained. Surface runoff is rapid. Permeability is moderately slow, and available water capacity is low.

Urban land consists mainly of streets, parking areas, houses, and buildings. Part of the Urban land is in the Camp Bowie area and consists of remnants of abandoned streets and building foundations and spots that have 6 to 10 inches of gravel or caliche material. Much of this area has been altered by grading and shaping.

Included in this complex are small areas of Callahan and Pedernales soils. In spots, sandstone fragments and bedrock outcrop are at the surface.

Potential for most urban uses is medium. Shrinking and swelling of the soil with changes in moisture, the moderate depth to rock, and high corrosivity to uncoated steel are the main limitations, but they can be overcome by good design and careful installation procedures. The depth to rock and the moderately slow permeability of the subsoil are limitations to septic tank absorption fields. Potential for recreational uses is medium. The depth to rock and the moderately slow permeability are the most restrictive features.

This complex is not placed in a capability subclass or range site.

10—Bonti-Callahan association, undulating. This association consists of stony, moderately deep soils on uplands. Slopes are mainly 1 to 8 percent. Areas are irregular to oblong in shape and range from 20 to several hundred acres (fig. 3).

Bonti soils make up about 73 percent of the association, Callahan soils about 22 percent, and other soils about 5 percent. The composition of this map unit is more variable than that of most of the other map units in the survey area; however, the composition has been controlled well enough so that the map unit can be interpreted for the expected uses of the soils.

The gently sloping Bonti soils are on ridgetops that are underlain by sandstone. Typically, they have a surface layer that is friable, neutral, brown stony fine sandy loam about 11 inches thick. A few sandstone boulders are on the surface. The subsoil extends to a depth of 38 inches. It is firm, medium acid clay loam that is reddish brown to a depth of 20 inches and reddish yellow below 20 inches. Strongly cemented sandstone is at a depth of 38 inches.

Bonti soils are well drained. Surface runoff is rapid. Permeability is moderately slow, and available water capacity is low.

Typically, Callahan soils are on side slopes that are underlain by shale. Typically, they have a surface layer that is friable, neutral, dark grayish brown stony loam about 6 inches thick. The subsoil is firm, brown clay that extends to a depth of 34 inches. The underlying material to a depth of 65 inches is yellowish brown shaly clay interbedded with a few layers of slightly hard sandstone.

Callahan soils are well drained. Surface runoff is rapid. Permeability is very slow, and available water capacity is low.

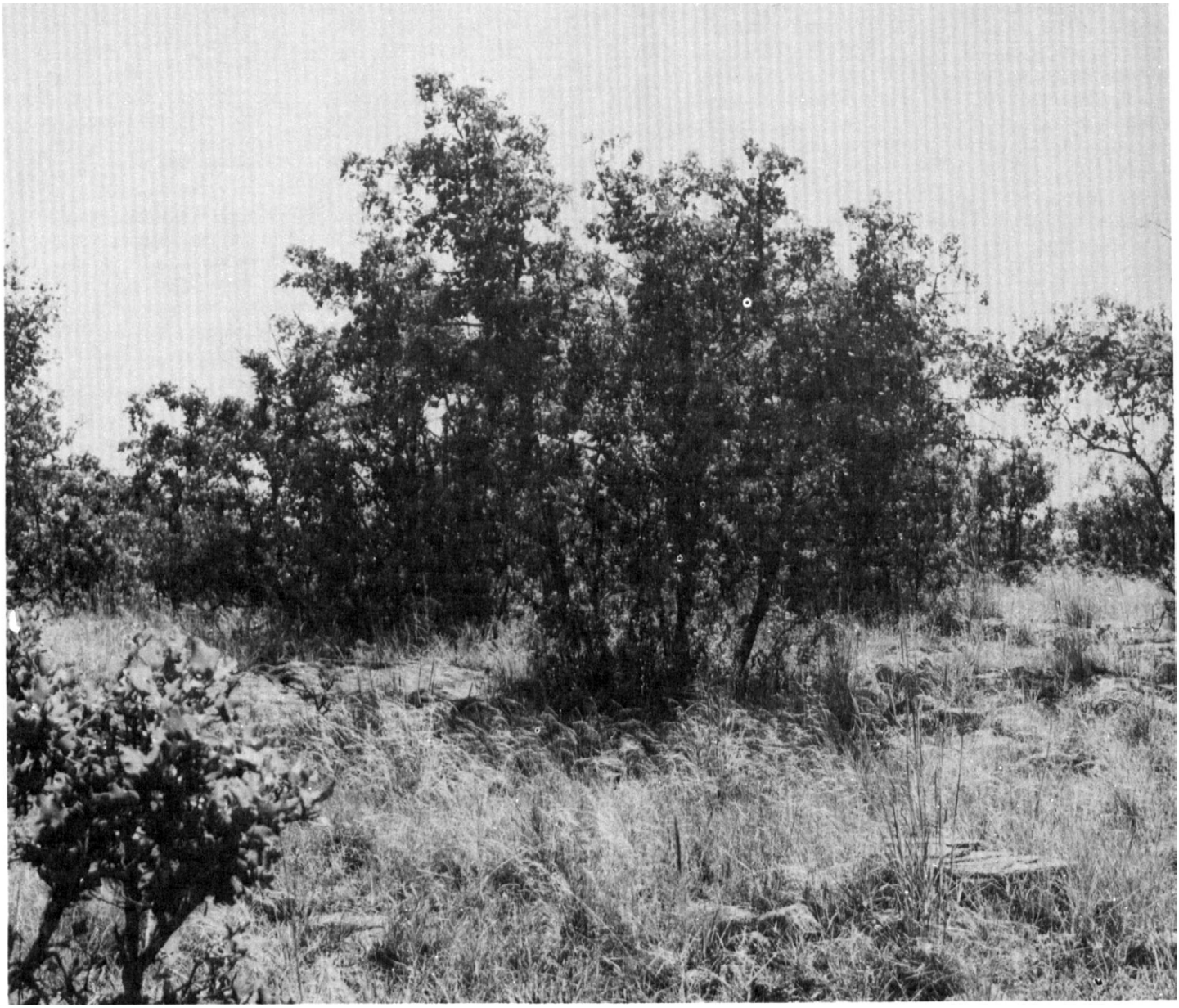


Figure 3.—Area of Bonti stony fine sandy loam in an area of Bonti-Callahan association, undulating.

Included in this association are small areas of Throck soils. Included on ridgetops are small areas of soils that are similar to Bonti soils but are underlain by sandstone at a depth of less than 20 inches. Also included are small areas of soils that are similar to Pedernales soils but are underlain by shaly clay. Small outcrops of sandstone are in some areas. Some short slopes along drainageways are moderately steep to steep.

These Bonti and Callahan soils are generally too stony or steep for cultivation. The few areas of arable soils are so small and irregularly shaped that cultivation is impractical. These soils are better suited to native grass.

Potential for native plants is medium. Rapid runoff, low available water capacity, and restricted rooting depth limit forage production. The climax plant community is a mixture of tall and mid grasses, forbs, and post oak. Management needs are proper stocking, controlled grazing, and brush management. Potential for wildlife habitat is medium.

Potential for most urban or recreational uses is low.

The moderate depth to bedrock, high corrosivity to uncoated steel, shrinking and swelling of the soil with changes in moisture, slope, and the stony surface layer are the main limitations.

This association is in capability subclass VIs. Bonti soils are in the Sandy Loam range site, and Callahan soils are in the Claypan Prairie range site.

11—Bonti-Throck association, hilly. This association consists of stony, moderately deep and deep soils on ridgetops and side slopes in areas of hilly uplands. Slopes are 10 to 30 percent. Areas are irregular in shape and range from 20 to several hundred acres.

Bonti soils make up about 50 percent of the association, Throck soils about 38 percent, and other soils about 12 percent. The composition of this map unit is more variable than that of most of the other map units in the survey area; however, the composition has been controlled well enough so that the map unit can be interpreted for the expected uses of the soils.

Bonti soils are moderately deep. They are mainly on the ridgetops. Typically, they have a surface layer that is friable, neutral, stony fine sandy loam about 8 inches thick and is brown in the upper part and pale brown in the lower part. The subsoil extends to a depth of 30 inches. It is slightly acid clay that is yellowish red to a depth of 22 inches and reddish yellow below 22 inches. Light yellowish brown hard sandstone is at a depth of 30 inches.

Bonti soils are well drained. Surface runoff is rapid. Permeability is moderately slow, and available water capacity is low.

Throck soils are deep. They are mainly on the side slopes. Typically, they have a surface layer that is firm, moderately alkaline, grayish brown stony clay about 10 inches thick. The subsoil to a depth of 22 inches is very firm, moderately alkaline, grayish brown clay. The underlying material to a depth of 36 inches is dark reddish gray and light olive brown shaly clay.

Throck soils are well drained. Surface runoff is rapid. Permeability is slow, and available water capacity is low.

Included in some areas of this association are areas of Callahan soils and shallow soils similar to the Bonti soils. Also included are eroded areas of the Throck soils where sheet erosion or shallow gullies have removed most of the surface layer. Sandstone outcrops are around the edge of the ridgetops of many areas.

These Bonti and Throck soils are not suitable for cultivation because of slope, stoniness, restricted rooting depth, and susceptibility to erosion. These soils are mainly used for range. Potential for native range plants is medium. Rapid runoff, low available water capacity, and restricted rooting depth limit the amount of forage produced. Management needs are proper stocking and controlled grazing. Potential for wildlife habitat is medium to low.

These soils have low potential for most urban uses. Slope, the moderate depth to rock, shrinking and swelling of the soil with changes in moisture, and high corrosivity to uncoated steel are the main limitations. Potential for recreational uses is also low because of steep slopes and stoniness.

This association is in capability subclass VIIs. Bonti soils are in the Sandstone Hills range site, and Throck soils are in the Rocky Hills range site.

12—Bosque loam, occasionally flooded. This deep, nearly level soil is on flood plains along major streams. Slopes are smooth and are 0 to 1 percent. Most of this soil is subject to flooding about once in every 3 to 10 years, but some areas are rarely flooded because they are protected by flood prevention structures. Areas are long and narrow and range from 10 to several hundred acres.

Typically, the surface layer is friable, moderately alkaline loam about 26 inches thick. It is dark grayish brown in the upper 18 inches and brown in the lower 8 inches. The subsoil extends to a depth of 64 inches. It is friable, moderately alkaline loam that is brown to a depth of 48 inches and light yellowish brown below 48 inches (fig. 4).

This soil is well drained. Surface runoff is slow. Permeability is moderate, and available water capacity is high.

Included in some areas of this soil are small areas of Frio soils that contain more clay than Bosque soils. These Frio soils are adjacent to clayey upland soils. Areas of Energy soils are adjacent to stream channels in some places. Small areas of May and Sunev soils are on slightly higher elevations in some areas. These included soils make up less than 20 percent of any mapped area.

This soil is mainly used as cropland and pastureland. Small grain and grain sorghum are the main cultivated crops. Pecans are also well suited.

Potential for wheat, oats, forage sorghum, and grain sorghum is high. Crop residue left on or near the surface helps to conserve moisture and maintain tilth and productivity.

Potential for pasture production is high. Pasture grasses such as johnsongrass, Coastal bermudagrass, and kleingrass are well suited to this soil.

Potential for native range plants is high. The climax plant community is a mixture of tall and mid grasses, forbs, and scattered shrubs and trees. Management needs are proper stocking, controlled grazing, and brush management. Potential for wildlife habitat is high.

This soil has low potential for most urban uses. Flooding is a severe limitation that is very difficult to overcome. Potential for most recreational uses is medium. Flooding restricts the use of this soil for camp areas and playgrounds.

This soil is in capability subclass IIw and the Loamy Bottomland range site.

13—Brackett association, undulating. This association consists of shallow, gravelly soils on uplands. Slopes are 1 to 8 percent but average about 6 percent.

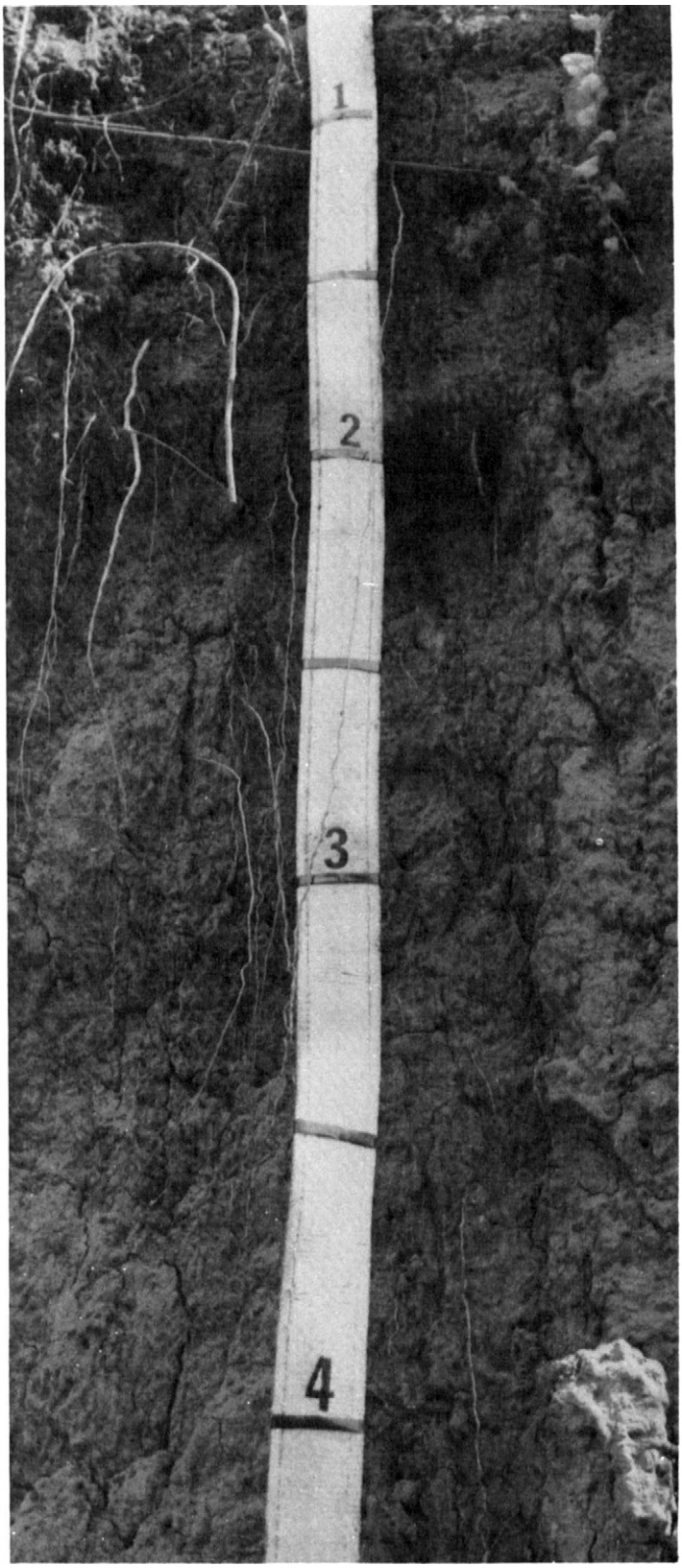


Figure 4.—Profile of Bosque loam, occasionally flooded.

Areas are irregular in shape and range from 20 acres to several hundred acres.

Brackett soils make up about 58 percent of the association, and other soils make up about 42 percent. The composition of this map unit is more variable than that of most of the other map units in the survey area; however, the composition has been controlled well enough so that the map unit can be interpreted for the expected uses of the soils.

Typically, Brackett soils have a surface layer that is friable, moderately alkaline, grayish brown gravelly clay loam about 8 inches thick. The subsoil to a depth of 16 inches is friable, moderately alkaline, brown gravelly clay loam. The underlying material to a depth of 41 inches is weakly cemented, light brownish gray limestone and limy earth.

These soils are well drained. Surface runoff is rapid. Permeability is moderately slow, and available water capacity is very low. The hazard of erosion is moderate.

Included in this association are small areas of Tarrant, Speck, and Real soils that are mainly on ridgetops. Also included are small areas of Sunev, Hext, Bolar, and Menard soils that are on lower slopes. Some areas have slopes of more than 8 percent.

The soils in this association are generally too gravelly or too steep for cultivation. The few areas of arable soils are so small and irregularly shaped that cultivation is impractical. These soils are better suited to native grass (fig. 5).

Potential for native plants is medium. Rapid runoff, very low available water capacity, and restricted rooting depth limit forage production. The climax plant community is a mixture of tall and mid grasses, forbs, and live oak and Texas oak. Management needs are proper stocking, controlled grazing, and brush management. Potential for wildlife habitat is medium.

The soils in this association have medium potential for most urban or recreational uses. Slope, the shallow depth to rock, and the gravelly surface layer are the main limitations.

This association is in capability subclass VIs and the Adobe range site.

14—Brackett-Tarrant association, hilly. This association consists of very shallow to shallow, gravelly and very cobbly soils on uplands. Slopes are 10 to 30 percent. Areas are irregular in shape and range from 20 to several hundred acres.

Brackett soils make up about 63 percent of the association, Tarrant soils about 20 percent, and other soils about 17 percent. The composition of this map unit is more variable than that of most of the other map units in the survey area; however, the composition has been controlled well enough so that the map unit can be interpreted for the anticipated uses of the soils.

Brackett soils are shallow. They are mainly on the steep side slopes. Typically, they have a surface layer that is friable, moderately alkaline, light brown gravelly clay loam about 5 inches thick. The subsoil to a depth of

Figure 5.—Area of Brackett association, undulating, in the Adobe range site.

17 inches is friable, moderately alkaline, very pale brown gravelly clay loam. The underlying material to a depth of 41 inches is weakly cemented calcareous limestone and light yellowish brown marl (fig. 6).

Brackett soils are well drained. Surface runoff is rapid. Permeability is moderately slow, and available water capacity is very low.

Tarrant soils are very shallow to shallow. They are mainly on the sloping ridgetops. Typically, they have a surface layer that is firm, moderately alkaline, dark brown very cobbly clay loam about 10 inches thick. Below this is platy, fractured limestone bedrock.

Tarrant soils are well drained. Surface runoff is rapid. Permeability is moderately slow, and available water capacity is very low.

Included in some areas of this association are areas of Bolar and Hext soils. Also included are eroded areas where sheet erosion has removed most of the surface layer. Most areas have a few gullies.

These Brackett and Tarrant soils are not suitable for cultivation because of slope, stoniness, shallow rooting depth, and susceptibility to erosion. They are mainly used for range, but potential for native range plants is low. Rapid runoff, very low available water capacity, and restricted rooting depth limit the amount of forage produced. Management needs are proper stocking and controlled grazing. Potential for wildlife habitat is medium to low.

Potential is low for most urban uses. Slope, the shallow depth to rock, stoniness, and high corrosivity to uncoated steel are the main limitations. Potential for recreational uses is low because of steep slopes, the shallow depth to bedrock, and stoniness.

This association is in capability subclass VIIs. Brackett soils are in the Steep Adobe range site, and Tarrant soils are in the Steep Rocky range site.

15—Callahan loam, 1 to 3 percent slopes. This moderately deep, gently sloping soil is on uplands.

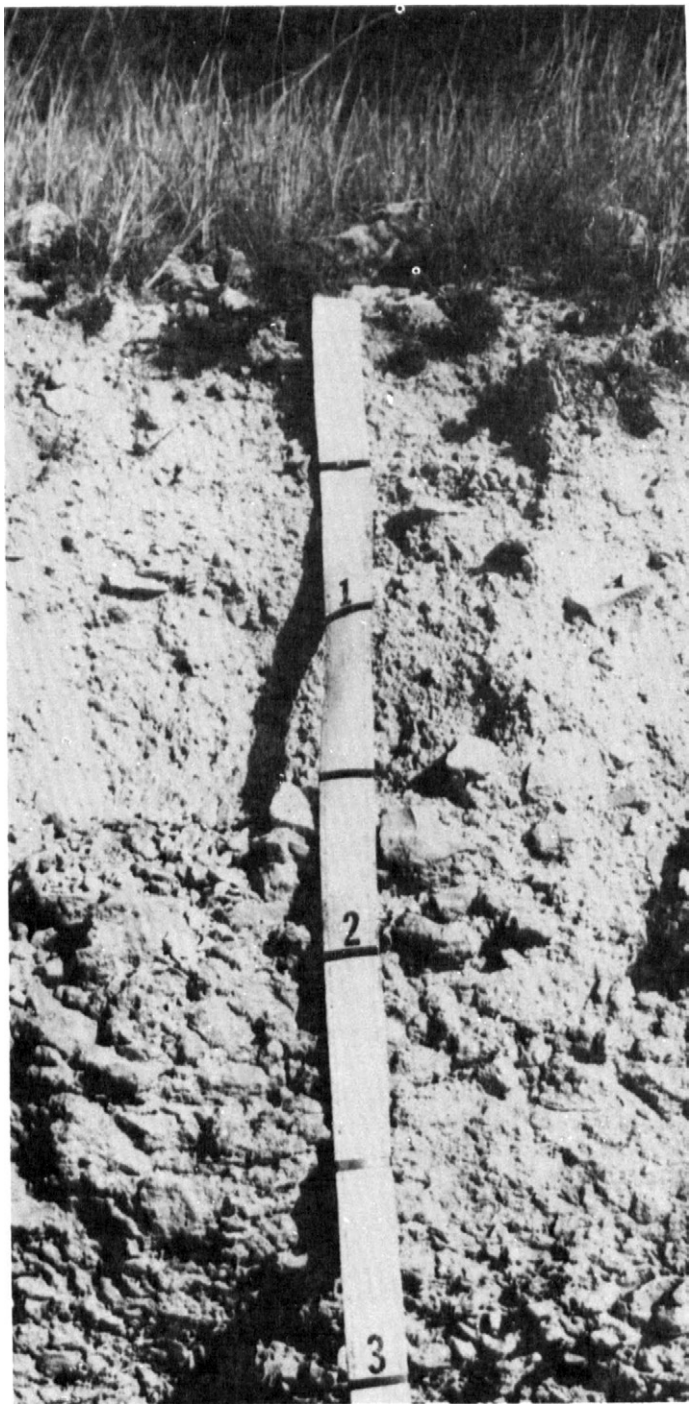


Figure 6.—Profile of Brackett gravelly clay loam in an area of Brackett-Tarrant association, hilly.

Slopes are smooth. Areas are elongated to irregular in shape and range from 10 to 500 acres or more.

Typically, the surface layer is firm, neutral, brown loam about 4 inches thick. The subsoil extends to a depth of 38 inches. It is very firm, moderately alkaline, reddish brown clay to a depth of 19 inches and firm, moderately alkaline, brown clay below 19 inches. The underlying material to a depth of 65 inches is light olive brown shaly clay.

This soil is well drained. Surface runoff is medium. Permeability is very slow, and available water capacity is low.

Included in some areas of this soil are small areas of Bonti, Throck, Pedernales, Sagerton, and Nukrum soils. Also included are areas of soils that are similar to this Callahan soil but are slowly permeable and support post oak trees. These included soils make up less than 25 percent of any mapped area.

This soil is used as rangeland and cropland. Potential for native range plants is medium. The climax plant community is a mixture of mid and short grasses and forbs. Management needs are proper stocking, controlled grazing, and brush management. Potential for wildlife habitat is medium.

Potential for wheat, oats, and grain sorghum is medium. Keeping crop residue on or near the surface helps to prevent erosion and conserve moisture. Contour farming and terraces are needed in most areas to prevent erosion.

Potential for pasture production is medium. Improved grasses such as kleingrass, weeping lovegrass, King Ranch bluestem, and Coastal bermudagrass are suited to this soil (fig. 7).

Potential for most urban uses is medium. Shrinking and swelling of the soil with changes in moisture, the clayey subsoil, and high corrosivity to uncoated steel are the main limitations, but they can be overcome by good design and careful installation procedures. The very slow permeability of the subsoil limits the use of this soil for septic tank absorption fields. Potential for recreational uses is medium because of very slow permeability.

This soil is in capability subclass IIIe and the Claypan Prairie range site.

16—Callahan loam, 1 to 5 percent slopes, eroded. This moderately deep, gently sloping soil is on uplands. Slopes are smooth. The surface layer has been thinned by sheet erosion, and the subsoil is exposed in shallow crossable gullies. Shallow rills and channels are common in each mapped area. Areas are irregular in shape and range from 10 to several hundred acres.

Typically, the surface layer is friable, moderately alkaline, brown loam about 6 inches thick. The subsoil extends to a depth of 32 inches. It is firm, moderately alkaline, reddish brown clay loam to a depth of about 16 inches and very firm, moderately alkaline, reddish brown clay below 16 inches. The underlying material to a depth

Figure 7.—King Ranch bluestem on Callahan loam, 1 to 3 percent slopes.

of 65 inches is light yellowish brown, weakly cemented sandstone interbedded with shale.

This soil is well drained. Surface runoff is medium. Permeability is very slow, and available water capacity is low.

Included in some areas of this soil are small areas of Bonti, Throck, Pedernales, Sagerton, Nukrum, and Winters soils and areas of a soil that is similar to this Callahan soil but is slowly permeable and supports post oak trees. Also included are small areas that are severely eroded. These included soils make up less than 25 percent of any mapped area.

This soil can be cultivated, but it is mainly used as rangeland. Potential for native range plants is medium. The climax plant community is a mixture of mid and short grasses and forbs. Management needs are proper stocking, controlled grazing, and brush management. Potential for wildlife habitat is medium.

Potential for wheat, oats, and grain sorghum is medium. Keeping crop residue on or near the surface helps to prevent erosion and conserve moisture. Contour farming and terraces are needed in most areas to prevent erosion.

Potential for pasture production is medium. Improved grasses such as kleingrass, weeping lovegrass, King Ranch bluestem, and Coastal bermudagrass are suited to this soil.

Potential for most urban uses is medium. Shrinking and swelling of the soil with changes in moisture, the clayey subsoil, and high corrosivity to uncoated steel are the main limitations, but they can be overcome by good design and careful installation procedures. The very slow permeability of the subsoil limits the use of this soil for septic tank absorption fields. Potential for recreational uses is medium because of very slow permeability.

This soil is in capability subclass IVe and the Claypan Prairie range site.

17—Callahan-Urban land complex, 1 to 5 percent slopes. This gently sloping complex is on uplands. Areas are oblong to irregular in shape and range from 20 to 400 acres.

Callahan soils make up about 45 percent of the complex, Urban land about 40 percent, and other soils about 15 percent. The soils and Urban land are so intricately mixed that it is not practical to map them separately.

Undisturbed areas of Callahan soils typically have a surface layer that is friable, moderately alkaline, brown loam about 7 inches thick. The subsoil extends to a depth of 32 inches. It is very firm, moderately alkaline clay. The subsoil is reddish brown to a depth of 18 inches, light reddish brown to a depth of 24 inches, and brown below 24 inches. The underlying material to a depth of 65 inches is very pale brown sandy shale.

Callahan soils are moderately deep and well drained. Surface runoff is medium. Permeability is very slow, and available water capacity is low.

Urban land consists mainly of streets, parking areas, houses, and buildings. Part of the Urban land is in the Camp Bowie area and consists of remnants of abandoned streets and building foundations and spots that have 6 to 10 inches of gravel or caliche material. Much of this area has been altered by grading and shaping.

Included in this complex are small areas of Bonti, Throck, and Winters soils.

Potential for most urban uses is medium. Shrinking and swelling of the soil with changes in moisture, the clayey subsoil, and high corrosivity to uncoated steel are the main limitations, but they can be overcome by good design and careful installation procedures. The very slow permeability of the subsoil limits the use of the soils for septic tank absorption fields. Potential for recreational uses is medium because of very slow permeability.

This complex is not placed in a capability subclass or range site.

18—Callahan-Throck association, undulating. This association consists of stony, moderately deep and deep soils on uplands. Slopes range from 1 to 8 percent, but average about 6 percent. Soil areas are irregular in shape and range from 50 to several hundred acres (fig. 8).

Callahan soils make up about 52 percent of the association, Throck soils about 44 percent, and other soils about 4 percent. The composition of this map unit is more variable than that of most of the other map units in the survey area; however, the composition has been controlled well enough so that the map unit can be interpreted for the anticipated uses of the area involved.

The gently sloping Callahan soils are moderately deep. They are on side slopes and foot slopes. Typically, they have a surface layer that is firm, moderately alkaline, brown stony clay loam about 6 inches thick. The subsoil is firm, moderately alkaline, reddish brown clay that extends to a depth of about 32 inches. The underlying material to a depth of 62 inches is pale yellow and reddish brown shaly clay.

Callahan soils are well drained. Surface runoff is rapid. Permeability is very slow, and available water capacity is low.

Figure 8.—Area of Callahan-Throck association, undulating.

The Throck soils are deep. They are on mid slopes and upper slopes below ridgetops. Typically, they have a surface layer that is firm, moderately alkaline, brown stony clay about 6 inches thick. The subsoil to a depth of 30 inches is firm, moderately alkaline, yellowish brown clay that contains dark red mottles in the lower part. The underlying material to a depth of 54 inches is weak red, reddish yellow, and gray shaly clay.

Throck soils are well drained. Surface runoff is rapid. Permeability is slow, and available water capacity is medium.

Included in this association are small areas of Bonti and Tarrant soils on ridgetops. Also included are small areas of Pedernales soils.

These Callahan and Throck soils are generally too stony or steep for cultivation. The areas of arable soils are so small and irregularly shaped that cultivation is impractical. These soils are better suited to native grass.

Potential for native plants is medium. Rapid runoff, medium to low available water capacity, and restricted rooting depth limit forage production. The climax plant community is a mixture of mid grasses, forbs, and shrubs. Management needs are proper stocking, controlled grazing, and brush management. Potential for wildlife habitat is medium.

Potential for most urban or recreational uses is medium. Slope, high corrosivity to uncoated steel, shrinking and swelling of the soil with changes in moisture, and

stoniness and the high content of clay in the surface layer are the main limitations.

This association is in capability subclass VIs. Callahan soils are in the Claypan Prairie range site, and Throck soils are in the Shallow Clay range site.

19—Caradan clay loam, 1 to 3 percent slopes. This deep, gently sloping soil is on uplands, mainly on slightly convex plateaus. Areas are irregular in shape and range from 10 to 200 acres or more.

Typically, the surface layer is firm, neutral, brown clay loam about 4 inches thick. The subsoil extends to a depth of 36 inches. It is very firm, slightly acid, reddish brown clay to a depth of 25 inches. Below that, it is firm, moderately alkaline, reddish brown clay loam that contains accumulations of calcium carbonate. The underlying material to a depth of 62 inches is very friable, moderately alkaline, pink silt loam that is about 70 percent calcium carbonate equivalent.

This soil is well drained. Surface runoff is medium. Permeability is very slow, and available water capacity is medium.

Included in some areas of this soil are small areas of Tarpley soils that are underlain by limestone at a shallow depth. Also included are a few areas of soils that are similar to the Caradan soils, except they are underlain by limestone at a depth of about 40 inches. These included soils make up less than 15 percent of any mapped area.

This soil is used as cropland and rangeland. Potential for native range plants is high. The climax plant community is a mixture of tall and mid grasses, forbs, and occasional shrubs and live oak trees. Management needs are proper stocking, controlled grazing, and brush management. Potential for wildlife habitat is medium.

Potential for oats and grain sorghum is high. Keeping crop residue on or near the surface helps to prevent erosion and conserve moisture. It also helps to improve soil tilth and water intake. Contour farming and terraces are needed in most areas to prevent water erosion.

Potential for pasture production is high. Improved grasses such as kleingrass, Coastal bermudagrass, weeping lovegrass, and King Ranch bluestem are suited to this soil.

Potential for most urban or recreational uses is low. Shrinking and swelling of the soil with changes in moisture, high corrosivity to uncoated steel, and very slow permeability are the main limitations.

This soil is in capability subclass IIIe and the Deep Redland range site.

20—Chaney loamy fine sand, 1 to 5 percent slopes. This deep, gently sloping soil is on uplands. Slopes are slightly convex to slightly concave. Areas are round to irregular and range from 10 to several hundred acres.

Typically, the surface layer is very friable, slightly acid, loamy fine sand about 18 inches thick. It is brown in the upper 6 inches and very pale brown in the lower 12 inches. The subsoil extends to a depth of 44 inches. It is firm, medium acid, brownish yellow sandy clay mottled with red and gray. The underlying material to a depth of 60 inches is light gray sandy clay.

This soil is moderately well drained. Surface runoff is slow. Permeability is slow. Available water capacity is medium.

Included in some areas of this soil are small areas of Cisco, Pedernales, Nimrod, and Patilo soils. A soil that is similar to this Chaney soil but has a sandy surface layer more than 20 inches thick is in some areas. Some areas contain a few eroded spots. Also included are a few areas that have slopes of less than 1 percent. These included soils make up less than 20 percent of any mapped area.

This soil is mainly used as cropland and pastureland. Peanuts and grain sorghum are the main crops. Potential for peanuts is high, and potential for grain sorghum is medium (fig. 9). Keeping crop residue on the surface helps to conserve moisture, control wind erosion, and maintain tilth. Contour farming and terraces are needed in most areas to prevent erosion. Peaches, apples, and melons are also well suited to this soil.

Potential for native range plants is high. The climax plant community is a mixture of tall and mid grasses, forbs, and oak trees. Management needs are proper stocking, controlled grazing, and brush management. Potential for wildlife habitat is also high.

Potential for pasture production is high. Improved grasses such as Coastal bermudagrass, weeping lovegrass, and kleingrass are well suited to this soil.

Potential for most urban or recreational uses is medium. Shrinking and swelling of the soil with changes in moisture, slow permeability, and the sandy surface layer are the main limitations, but they can be overcome by good design and careful installation procedures.

This soil is in capability subclass IIIe and the Loamy Sand range site.

21—Cisco loamy fine sand, 1 to 3 percent slopes. This deep, gently sloping soil is on uplands. Slopes are smooth. Areas are broad to irregular in shape and range from 10 to several hundred acres.

Typically, the surface layer is friable, slightly acid, loamy fine sand about 10 inches thick. It is brown in the upper 6 inches and very pale brown in the lower 4 inches. The subsoil extends to a depth of 44 inches. It is firm, slightly acid, yellowish red sandy clay loam to a depth of 26 inches and firm, slightly acid, yellowish red loam to a depth of 38 inches. Below that, it is friable, mildly alkaline, yellowish red sandy loam. The underlying material to a depth of 63 inches is weakly cemented, reddish yellow fine sandy loam that contains accumulations of calcium carbonate.

This soil is well drained. Surface runoff is very slow. Permeability is moderate, and available water capacity is medium.

Included in some areas of this soil are small areas of Pedernales, Chaney, and Nimrod soils. Also included are

Figure 9.—Stripcropping of peanuts and grain sorghum on Chaney loamy fine sand, 1 to 5 percent slopes.

a few eroded spots on convex slopes that have a surface layer of fine sandy loam. These included soils make up less than 20 percent of any mapped area.

This soil is mainly used as cropland, but some areas are used as pastureland and rangeland. Peanuts is the main crop, but other crops are also grown.

Potential for peanuts is high and for grain sorghum is medium. Good management practices are leaving crop residue on the surface when crops are not being grown, timely and limited tillage, and the use of cover crops. These practices help control wind and water erosion. Peaches, apples, and melons are also well suited to this soil.

Potential for pasture production is high. Improved grasses such as Coastal bermudagrass, weeping lovegrass, and kleingrass are well suited to this soil.

Potential for native range plants is high. The climax plant community is a mixture of tall and mid grasses, forbs, and oak trees. Management needs are proper stocking, controlled grazing, and brush management. Potential for wildlife habitat is also high.

Potential for most urban or recreational uses is medium. Shrinking and swelling of the soil with changes in moisture and the sandy surface layer are the main limitations.

This soil is in capability subclass IIIe and the Loamy Sand range site.

22—Cisco fine sandy loam, 1 to 3 percent slopes. This deep, gently sloping soil is on uplands. Slopes are smooth. Areas are broad to irregular in shape and range from 10 to 200 acres or more.

Typically, the surface layer is friable, neutral, brown fine sandy loam about 8 inches thick. The subsoil is firm, neutral, reddish brown sandy clay loam to a depth of 46 inches. The underlying material to a depth of 63 inches is moderately alkaline, reddish yellow loam that contains accumulations of calcium carbonate.

This soil is well drained. Surface runoff is slow. Permeability is moderate, and available water capacity is high. This soil has good tilth and can be worked throughout a wide range of moisture conditions.

Included in some areas of this soil are small areas of Pedernales, Menard, and Hext soils. Also included are a

few areas of soils that are similar to this Cisco soil, but the subsoil extends to a depth of less than 40 inches. These included soils make up less than 15 percent of any mapped area.

This soil is mainly used as cropland. Oats and peanuts are the main cultivated crops. Potential for peanuts and grain sorghum is high. Potential for small grain is medium. Keeping crop residue on the surface helps to conserve moisture, control wind erosion, and maintain tilth. Terraces and contour farming help to control water erosion. Peaches, apples, and melons are well suited to this soil.

Potential for native range plants is high. The climax plant community is a mixture of tall and mid grasses, forbs, and oak trees. Management needs are proper stocking, controlled grazing, and brush management. Potential for wildlife habitat is also high.

Potential for pasture production is high. Improved grasses such as Coastal bermudagrass, kleingrass, and weeping lovegrass are well suited to this soil.

Potential for most urban uses is medium. Shrinking and swelling of the soil with changes in moisture is the main limitation, but this can be overcome by good design and careful installation procedures. Potential for most recreational uses is high.

This soil is in capability subclass IIe and the Sandy Loam range site.

23—Cisco fine sandy loam, 2 to 5 percent slopes, eroded. This deep, gently sloping soil is on uplands. Slopes are smooth. Many areas have shallow gullies and eroded areas at intervals of 100 to 300 feet where 50 to 75 percent of the original surface layer has been removed. Some areas have deeper gullies on lower slopes where water is concentrated. Areas are irregular in shape and range from 10 to 200 acres.

Typically, the surface layer is friable, neutral, brown fine sandy loam about 4 inches thick. The subsoil extends to a depth of about 44 inches. It is firm, neutral, yellowish red sandy clay loam to a depth of about 30 inches. Below that, it is friable, moderately alkaline, yellowish red sandy clay loam. The underlying material to a depth of 63 inches, is moderately alkaline, pink fine sandy loam that is weakly cemented.

This soil is well drained. Surface runoff is medium. Permeability is moderate, and available water capacity is high.

Included in some areas of this soil are small areas of Pedernales, Menard, and Hext soils. Also included are a few areas that have slopes of less than 2 percent and a few small areas that have a sandy surface layer. These included soils make up less than 15 percent of any mapped area.

This soil is suitable for cultivation but is mainly used as pastureland and rangeland.

Potential for pasture production is medium. Improved grasses such as Coastal bermudagrass, kleingrass, and weeping lovegrass are well suited to this soil.

Potential for native range plants is high. The climax plant community is a mixture of tall and mid grasses, forbs, and oak trees. Management needs are proper stocking, controlled grazing, and brush management. Potential for wildlife habitat is also high.

Potential for peanuts, grain sorghum, and small grain is medium. Keeping crop residue on or near the surface helps to conserve moisture, control erosion, and maintain tilth. Terraces and contour farming also help to control erosion.

Potential for most urban uses is medium. Shrinking and swelling of the soil with changes in moisture is the main limitation, but this can be overcome by good design and careful installation procedures. Potential for most recreational uses is high. Slope is a limitation for playgrounds.

This soil is in capability subclass IIIe and the Sandy Loam range site.

24—Clairemont soils, frequently flooded. These deep, nearly level soils are on flood plains. Slopes are 0 to 1 percent. Most areas are subject to very brief periods of flooding at least once each year. Individual areas are long and narrow and range from 10 to several hundred acres.

The texture of the surface layer varies from area to area. It is mainly silt loam, but ranges to fine sandy loam, loam, or silty clay loam. These soils do not occur in a regular pattern. The composition of this map unit is more variable than that of most of the other map units in the survey area; however, the composition has been controlled well enough so that the map unit can be interpreted for the expected uses of the soils.

Typically, Clairemont soils have a surface layer that is friable, moderately alkaline, reddish brown silt loam about 14 inches thick. The underlying material to a depth of 62 inches is friable, moderately alkaline, reddish brown and light reddish brown silt loam stratified with fine sandy loam.

These soils are well drained. Permeability is moderate, and available water capacity is high.

Included in some areas of these soils are a few areas of Miller soils in poorly drained sloughs and depressions, Weswood soils on slightly higher benches, and areas of a sandy soil. Also included are narrow benches which have steeper slopes and separate different levels of the flood plains. These included soils make up less than 20 percent of any mapped area.

The Clairemont soils generally are not suitable for cultivation because of the hazard of flooding. They are subject to washing or scouring and to deposition of fresh alluvial sediment. They are mainly used as rangeland, but a few areas have been planted to introduced pasture grasses.

Potential for native range plants is high. The climax plant community is a mixture of tall and mid grasses, forbs, and scattered shrubs and trees. Management needs are proper stocking, controlled grazing, and brush management. Potential for wildlife habitat is medium.

Potential for pasture production is high. Introduced grasses such as Coastal bermudagrass, kleingrass, and johnsongrass are well suited. Pecans are also well suited.

These soils have low potential for urban uses. Flooding is a severe limitation that is very difficult to overcome. Potential for most recreational uses is medium. Flooding restricts the use of these soils for playgrounds and camp areas.

These soils are in capability subclass Vw and the Loamy Bottomland range site.

25—Deleon silty clay. This deep, nearly level soil is on broad flood plains. Flooding is unlikely but may occur rarely for brief periods under abnormal conditions. Areas are long and narrow to oblong and range from 40 to several hundred acres.

Typically, the surface layer is very firm, moderately alkaline silty clay that extends to a depth of about 66 inches. It is very dark grayish brown to a depth of 26 inches, dark grayish brown to a depth of 44 inches, and brown below 44 inches. The underlying material to a depth of 80 inches is very firm, moderately alkaline, brown silty clay.

This soil is moderately well drained. Surface runoff and permeability are slow, and available water capacity is high.

Included in some areas of this soil are small areas of Frio soils that are in slightly lower parts of the flood plain in more recently deposited sediment. A few small areas of Nukrum and Sagerton soils are on slightly higher elevations adjacent to hills. These included soils make up less than 15 percent of any mapped area.

This soil is mainly used as cropland or for improved pasture. Pecans are suited to this soil.

Potential for wheat, oats, grain sorghum, forage sorghums, and cotton is high. Crop residue left on or near the surface helps to conserve moisture and maintain tilth and productivity.

Potential for pasture production is high. Pasture grasses such as Coastal bermudagrass and kleingrass are well suited to this soil.

Potential for native range plants is high. The climax plant community consists mainly of mid grasses interspersed with small areas of tall and short grasses. Management needs are proper stocking, controlled grazing, and brush management. Potential for wildlife habitat is medium.

This soil has low potential for most urban uses. Flooding is a limitation that is very difficult to overcome. The soil shrinks and swells with changes in moisture and is highly corrosive to steel. Potential for most recreational uses is low because of the clayey surface layer.

This soil is in capability subclass IIs and the Clayey Bottomland range site.

26—Deleon-Urban land complex, 0 to 1 percent slopes. This complex consists of nearly level soils and Urban land on flood plains that are protected by flood prevention structures and Lake Brownwood. Flooding is not likely, but rare flooding may occur. Soil areas are oblong to irregular in shape and range from 12 to 170 acres.

Deleon soils make up about 60 percent of the complex, Urban land about 30 percent, and other soils about 10 percent. These soils are so intricately mixed, that it is not practical to map them separately.

Undisturbed areas of Deleon soils typically have a moderately alkaline surface layer that extends to a depth of 60 inches. The surface layer is firm, dark grayish brown silty clay to a depth of about 14 inches; very firm, dark brown silty clay to a depth of 40 inches; and very firm, brown clay loam below 40 inches. The underlying material to a depth of 80 inches is very firm, moderately alkaline, light brown clay loam.

Deleon soils are moderately well drained. Surface runoff and permeability are slow, and available water capacity is high.

The Urban land consists mainly of streets, parking areas, houses, parks, railroads, and buildings.

Included in this complex are areas of Frio soils that are near stream channels.

Potential for most urban uses is low. Rare flooding is possible during extremely wet periods. Flooding from local surface runoff is a main limitation. Shrinking and swelling of the soil with changes in moisture and high corrosivity to uncoated steel are also restrictive soil features. Slow permeability limits the use of septic tank absorption fields. Potential for recreational uses is also low. The clayey surface layer is the most restrictive feature.

This complex is not placed in a capability subclass or range site.

27—Denton silty clay, 1 to 3 percent slopes. This moderately deep, gently sloping soil is on uplands, mainly along slightly convex ridges. Areas are irregular in shape and range from 10 to about 150 acres.

Typically, the surface layer is firm, moderately alkaline silty clay about 28 inches thick. It is very dark grayish brown to a depth of 16 inches and brown below 16 inches. Strongly cemented, fractured limestone is at a depth of 28 inches.

This soil is well drained. Surface runoff is medium. Permeability is slow, and available water capacity is low.

Included in some areas of this soil are small areas of Bolar, Krum, Sunev, and Caradan soils. These included soils make up less than 20 percent of any mapped area.

This soil is mainly used as cropland and pastureland. Potential for oats, wheat, and grain sorghum is high. Keeping crop residue on or near the surface helps to prevent erosion and conserve moisture. It also helps to improve soil tilth and water intake. Contour farming and terraces are needed in most areas to prevent erosion. Where cuts or excavations exceed a depth of 28 inches, there is a hazard of cutting into a bed of strongly cemented limestone.

Potential for pasture production is high. Improved grasses such as kleingrass, Coastal bermudagrass, weeping lovegrass, and King Ranch bluestem are suited to this soil.

Potential for native range plants is high. The climax plant community is a mixture of tall and mid grasses, forbs, and occasional shrubs and live oak trees. Management needs are proper stocking, controlled grazing, and brush management. Potential for wildlife habitat is medium.

Potential for most urban or recreational uses is medium. The moderate depth to rock, shrinking and swelling of the soil with changes in moisture, and the clayey surface layer are the most restrictive features.

This soil is in capability subclass IIe and the Clay Loam range site.

28—Desan loamy fine sand, 0 to 5 percent slopes. This deep, nearly level to gently sloping soil is on uplands. Slopes are plane to slightly convex. Areas are broad and irregular in shape and are several hundred acres.

Typically, the surface layer is very friable, loamy fine sand that extends to a depth of about 54 inches. It is brown and slightly acid in the upper 8 inches and reddish yellow and medium acid below a depth of 8 inches. The subsoil to a depth of 80 inches is firm, medium acid, yellowish red sandy clay loam.

This soil is somewhat excessively drained. Surface runoff is very slow. Permeability is moderate, and available water capacity is low. The hazard of wind erosion is severe.

Included in some areas of this soil are small areas of Heaton, Bastrop, and Winters soils. These included soils make up less than 15 percent of any mapped area.

This soil is mainly used as cropland or for pecan orchards. Peanuts is the main cultivated crop.

Potential for peanuts, oats, and grain sorghum is medium. Vetch and rye are commonly grown as a winter cover crop. Keeping crop residue on the surface helps to conserve moisture, control wind erosion, and maintain tilth.

Potential for pasture production is medium. Improved grasses such as Coastal bermudagrass and weeping lovegrass are well suited to this soil.

Potential for rangeland is low because of low available water capacity. The main management practices needed are controlled grazing and proper stocking. Good plant cover needs to be maintained to control wind erosion. Potential for wildlife habitat is medium.

Potential for most urban uses is high. Potential for most recreational uses is low because of the sandy surface layer.

This soil is in capability subclass IIIe and the Deep Sand range site.

29—Doudle-Real association, undulating. This association consists of cobbly and very gravelly, moderately deep and shallow soils on uplands. Slopes are 1 to 8 percent. Areas are irregular in shape and range from 20 to 1,000 acres or more.

Doudle soils make up about 56 percent of the association, Real soils about 34 percent, and other soils about 10 percent. The composition of this map unit is more variable than that of most of the other map units in the survey area; however, the composition has been controlled well enough so that the map unit can be interpreted for the expected uses of the soils.

Doudle soils are moderately deep. They are mainly on the side slopes. Typically, they have a surface layer that is friable, moderately alkaline, brown cobbly loam about 6 inches thick. The subsoil extends to a depth of 36 inches. It is friable and moderately alkaline. The subsoil is light brown loam that contains accumulations of calcium carbonate to a depth of 13 inches, and below that, it is pink silt loam that also contains accumulations of calcium carbonate. The underlying material is stratified, weakly cemented calcareous sandstone and silt loam.

Doudle soils are well drained. Surface runoff is medium. Permeability is moderately rapid, and available water capacity is low.

Real soils are shallow and gently sloping. They are mainly on the ridgetops. Typically, they have a surface layer that is friable, moderately alkaline, brown very gravelly clay loam about 18 inches thick. The underlying material to a depth of 24 inches is weakly cemented limestone interbedded with thin seams of sandy clay loam.

Real soils are well drained. Surface runoff is rapid. Permeability is moderate, and available water capacity is very low.

Included in some areas of this association are areas of Brackett, Mereta, and Sunev soils. Also included are areas of Tarrant, Menard, and Pedernales soils.

Doudle and Real soils are generally too cobbly or gravelly and steep for cultivation. The few areas of arable soils are so small and irregularly shaped that cultivation is impractical. These soils are better suited to rangeland (fig. 10).

Potential for native plants is medium. Low available water capacity and restricted rooting depth limit forage production. The climax plant community is a mixture of tall and mid grasses, forbs, and live oak trees. Management needs are proper stocking, controlled grazing, and brush management. Potential for wildlife habitat is medium.

Potential for most urban or recreational uses is medium. Slope, the moderate to shallow depth to bedrock, and the cobbly or very gravelly surface layer are the main limitations.

This association is in capability subclass VIs. Doudle soils are in the Pink Caliche range site, and Real soils are in the Adobe range site.

30—Energy fine sandy loam, occasionally flooded. This deep, nearly level soil is on flood plains along small streams. Slopes are smooth and are 0 to 1 percent.

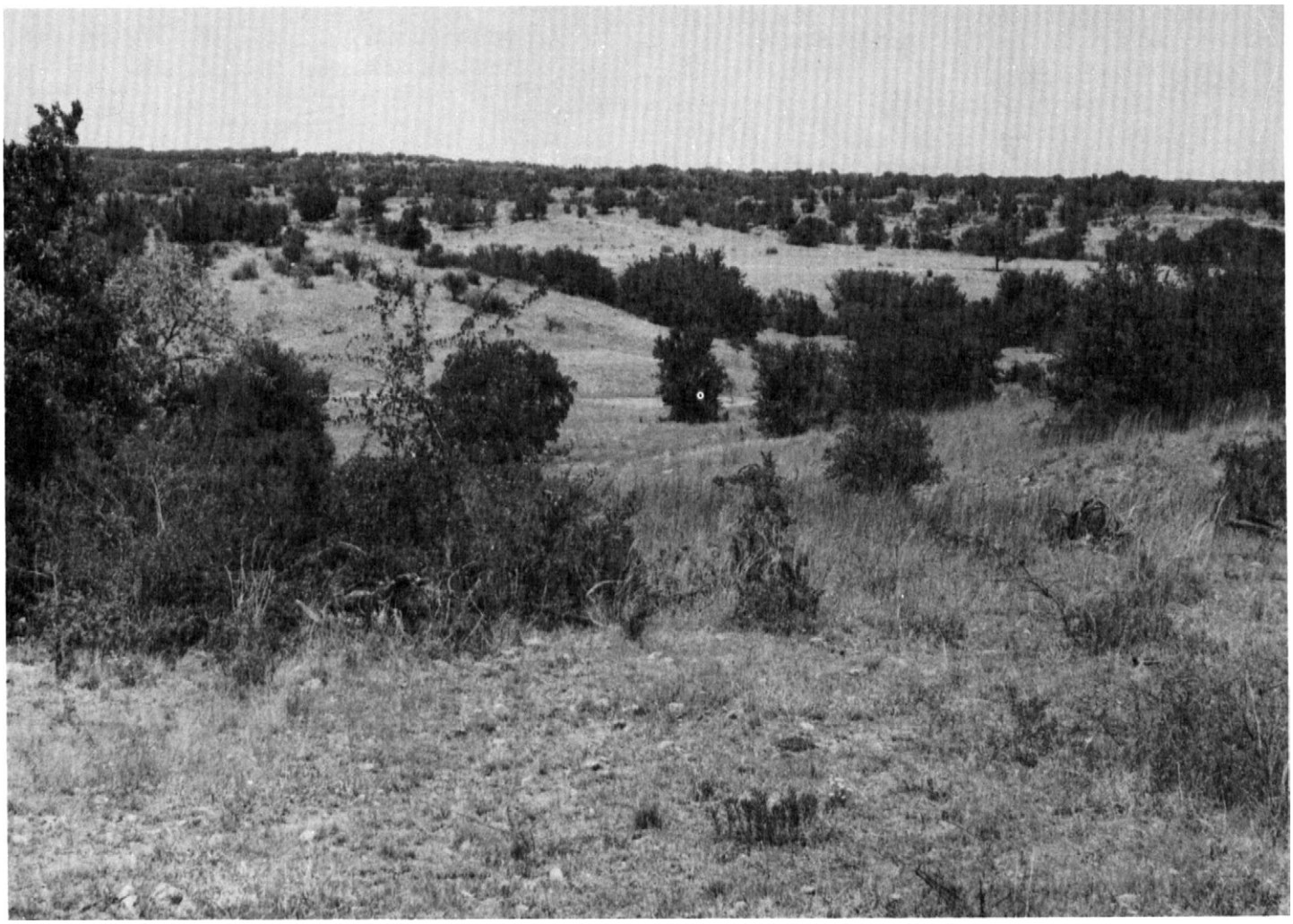


Figure 10.—Area of Doudle-Real association, undulating.

Most of this soil is subject to flooding about once in every 5 to 10 years unless it is protected by flood prevention structures. Areas are long and narrow and range from 10 to several hundred acres.

Typically, the surface layer is friable, moderately alkaline, pale brown fine sandy loam about 8 inches thick. The underlying material to a depth of 80 inches is firm, moderately alkaline, brown and yellowish brown sandy clay loam that is stratified with fine sandy loam.

This soil is well drained. Surface runoff is slow. Permeability is moderate, and available water capacity is high.

Included in some areas of this soil are small areas of Bosque and Frio soils and a soil similar to the Energy soil, except it is noncalcareous in the upper part. Small areas of May and Sunev soils are on slightly higher elevations in some areas. These included soils make up less than 20 percent of any mapped area.

This soil is suitable for cultivation but is mainly used as rangeland. Potential for native range plants is high. The climax plant community is a mixture of tall and mid grasses, forbs, and scattered shrubs and trees. Management needs are proper stocking, controlled grazing, and brush management. Potential for wildlife habitat is also high.

Potential for oats, wheat, forage sorghum, and grain sorghum is high. Crop residue left on or near the surface helps to conserve moisture and maintain tilth and productivity. Pecans are well suited to this soil.

Potential for pasture production is high. Pasture grasses such as Coastal bermudagrass, kleingrass, and johnsongrass are well suited to this soil.

This soil has low potential for most urban uses. Flooding is a severe limitation that is very difficult to over-

come. Potential for most recreational uses is medium. Flooding restricts the use of this soil for camp areas.

This soil is in capability subclass IIw and the Loamy Bottomland range site.

31—Frio silty clay loam, occasionally flooded. This deep, nearly level soil is on flood plains along major streams. Slopes are smooth and range from 0 to 1 percent. Most of this soil is subject to flooding about once in every 3 to 10 years, but some areas are rarely flooded because they are protected by flood prevention structures. Areas are mainly long and narrow and range from 10 to several hundred acres.

Typically, the surface layer is about 34 inches thick. It is firm, moderately alkaline, brown silty clay loam in the upper 7 inches. Below that, it is firm, moderately alkaline, dark brown and brown silty clay. The underlying material to a depth of 72 inches is firm, moderately alkaline, yellowish brown silty clay.

This soil is well drained. Surface runoff is slow. Permeability is moderately slow, and available water capacity is high.

Included in some areas of this soil are small areas of Bosque and Deleon soils. Areas of Energy soils are adjacent to stream channels in some places. Small areas of Krum and Sunev soils are on slightly higher elevations in some areas. These included soils make up less than 20 percent of any mapped area.

This soil is mainly used as cropland and pastureland. Small grain and grain sorghum are the main cultivated crops.

Potential for wheat, oats, forage sorghum, cotton, and grain sorghum is high. Crop residue left on or near the surface helps to conserve moisture and maintain tilth and productivity. Pecans are well suited to this soil.

Potential for pasture production is high. Pasture grasses such as Coastal bermudagrass, kleingrass, and johnsongrass are well suited to this soil.

Potential for native range plants is high. The climax plant community is a mixture of tall and mid grasses, forbs, and scattered shrubs and trees. Management needs are proper stocking, controlled grazing, and brush management. Potential for wildlife habitat is also high.

This soil has low potential for most urban uses. Flooding is a severe limitation that is very difficult to overcome. Potential for most recreational uses is medium. Flooding restricts the use of this soil for camp areas.

This soil is in capability subclass IIw and the Loamy Bottomland range site.

32—Frio silty clay loam, frequently flooded. This deep, nearly level soil is on flood plains along small streams. Areas are long and narrow and are parallel to the stream channels. Slopes are 0 to 1 percent. Most areas are subject to flooding once or twice a year. Individual areas range from 10 to several hundred acres.

Typically, the surface layer is about 31 inches thick. It is friable, moderately alkaline, very dark grayish brown silty clay loam in the upper 14 inches; friable, moderately alkaline, dark grayish brown loam to a depth of 22 inches; and friable, moderately alkaline, brown clay loam to a depth of 31 inches. The underlying material to a depth of 49 inches is friable, moderately alkaline, light brown fine sandy loam.

This soil is well drained. Surface runoff is slow. Permeability is moderately slow, and available water capacity is high. The hazard of erosion is moderate.

Included in some areas of this soil are small areas of Bosque, Energy, and Deleon soils. Also included in some places are areas that are dissected by wandering channels of intermittent streams. These included soils make up less than 20 percent of any mapped area.

This soil generally is not suitable for cultivation because of the hazard of flooding. It is subject to washing or scouring and to deposition of fresh alluvial sediment. This soil is mainly used as rangeland, but a few areas have been planted to improved pasture grasses.

Potential for native range plants is high. The climax plant community is a mixture of tall and mid grasses, forbs, and scattered trees. Management needs are proper stocking, controlled grazing, and brush management. Potential for wildlife habitat is medium.

Potential for pasture production is high. Pasture grasses such as johnsongrass, Coastal bermudagrass, and kleingrass are well suited to this soil. Pecans are also suited.

This soil has low potential for most urban uses. Flooding is a limitation that is very difficult to overcome. Potential for most recreational uses is medium. Flooding restricts the use of this soil for playgrounds and camp areas.

This soil is in capability subclass Vw and the Loamy Bottomland range site.

33—Frio-Urban land complex, 0 to 1 percent slopes. This complex consists of deep, nearly level soils and Urban land on flood plains that are protected by flood prevention structures and Lake Brownwood. Areas are elongated to irregular in shape and range from 10 to 125 acres. Flooding of this complex is unlikely but may occur rarely for brief periods under abnormal conditions.

Frio soils make up about 60 percent of the complex, Urban land about 30 percent, and other soils about 10 percent. These soils and Urban land are so intricately mixed that it is not practical to map them separately.

Undisturbed areas of Frio soils typically have a surface layer that extends to a depth of 50 inches. It is firm, moderately alkaline, dark grayish brown silty clay loam in the upper 12 inches and firm, moderately alkaline, dark brown and brown silty clay loam below a depth of 12 inches. The underlying material to a depth of 63 inches is firm, moderately alkaline, light brown clay loam.

Frio soils are well drained. Surface runoff is slow. Permeability is moderately slow, and available water capacity is high.

Urban land consists mainly of streets, parking areas, houses, railroads, and buildings. Part of the Urban land

is in the Camp Bowie area and consists of remnants of abandoned streets and building foundations and spots with 6 to 10 inches of gravel or caliche material. Much of this area has been altered by grading and shaping. Stream channels have been routed out of the original flood plain in some places.

Included in this complex are small areas of Deleon and Bosque soils.

Potential for most urban uses is low. Rare flooding is possible during extremely wet periods. Flooding from local surface runoff is a main limitation. Shrinking and swelling of the soil with changes in moisture and high corrosivity to uncoated steel are limitations that can be overcome by good design and careful installation procedures. The moderately slow permeability limits the use of the soils in this complex for septic tank absorption fields. Potential for recreational uses is medium. The high content of clay in the surface layer is the most restrictive feature.

This complex is not placed in a capability subclass or range site.

34—Heaton loamy fine sand, 0 to 3 percent slopes. This deep, gently sloping soil is on uplands. Slopes are plane to slightly convex. Areas are irregular to broad in shape and range from 10 to 280 acres.

Typically, the surface layer is very friable, medium acid loamy fine sand about 30 inches thick. It is pale brown in the upper 10 inches and light brown below a depth of 10 inches. The subsoil extends to a depth of 80 inches. It is firm, medium acid, red sandy clay loam to a depth of 55 inches and firm, slightly acid, yellowish red sandy clay loam below 55 inches.

This soil is well drained. Surface runoff is slow, and permeability is moderate. Available water capacity is medium. The hazard of wind erosion is severe.

Included in some areas of this soil are small areas of Desan, Bastrop, and Winters soils. Also included is a soil similar to this Heaton soil, except it has more clay in the subsoil. These included soils make up less than 10 percent of any mapped area.

This soil is mainly used as cropland or for pecan orchards. Peanuts is the main cultivated crop.

Potential for peanuts is high. Potential for grain sorghum and oats is medium. Keeping crop residue on the surface helps to conserve moisture, control wind erosion, and maintain tilth.

Potential for pasture production is high. Improved grasses such as Coastal bermudagrass and weeping lovegrass are well suited to this soil.

Potential for rangeland is medium. The main management practices needed are proper stocking and controlled grazing. Potential is high for wildlife habitat.

Potential is high for most urban uses. Potential for most recreational uses is low because of the sandy surface layer and slope.

This soil is in capability subclass IIIe and the Sandy range site.

35—Hext loam, 1 to 3 percent slopes. This moderately deep, gently sloping soil is on uplands. Slopes are smooth. Areas are irregular in shape and range from 10 to more than 100 acres.

Typically, the surface layer is friable, moderately alkaline, brown loam about 7 inches thick. The subsoil extends to a depth of 24 inches. It is friable, moderately alkaline, brown loam. The underlying material to a depth of 38 inches is weakly cemented siltstone stratified with light reddish brown loam that contains accumulations of calcium carbonate.

This soil is well drained. Surface runoff is slow. Permeability is moderate, and available water capacity is low.

Included in some areas of this soil are small areas of Menard, Pedernales, Cisco, Brackett, and Doudle soils. These included soils make up less than 15 percent of any mapped area.

This soil is suitable for cultivation but is mainly used as pastureland and rangeland. Potential for native range plants is medium. The climax plant community is a mixture of tall and mid grasses, forbs, and live oak trees. Management needs are proper stocking, controlled grazing, and brush management. Potential for wildlife habitat is high.

Potential for pasture production is medium. Improved grasses such as Coastal bermudagrass, kleingrass, and weeping lovegrass are suited to this soil.

Potential for grain sorghum, oats, and wheat is medium. Keeping crop residue on or near the surface helps to conserve moisture, control wind erosion, and maintain tilth. Terraces and contour farming help to control water erosion.

Potential for most urban uses is medium. Moderate corrosivity to uncoated steel and the moderate depth to rock are the main limitations, but they can be easily overcome by good design and careful installation procedures. Potential for most recreational uses is high. Slope and the depth to rock are limitations for playgrounds.

This soil is in capability subclass IIIe and the Sandy Loam range site.

36—Hext loam, 3 to 5 percent slopes. This moderately deep, gently sloping soil is on uplands. Slopes are smooth and convex. Areas are irregular to elongated in shape and range from 10 to 100 acres or more.

Typically, the surface layer is friable, moderately alkaline, brown loam about 5 inches thick. The subsoil extends to a depth of 22 inches. It is friable, moderately alkaline, sandy clay loam that is brown to a depth of 12 inches and very pale brown below 12 inches. The underlying material to a depth of 38 inches is soft, weakly cemented sandstone interbedded with calcareous loamy soil.

This soil is well drained. Surface runoff is slow. Permeability is moderate, and available water capacity is low.

Included in some areas of this soil are small areas of Menard, Pedernales, Cisco, Brackett, and Doudle soils. These included soils make up less than 15 percent of any mapped area.

This soil is suitable for cultivation but is mainly used as pastureland and rangeland. Potential for native range plants is medium. The climax plant community is a mixture of tall and mid grasses, forbs, and live oak trees. Management needs are proper stocking, controlled grazing, and brush management. Potential for wildlife habitat is high.

Potential for pasture production is medium. Improved grasses such as Coastal bermudagrass, kleingrass, and weeping lovegrass are suited to this soil.

Potential for grain sorghum, oats, and wheat is medium. Keeping crop residue on or near the surface helps to conserve moisture, control wind erosion, and maintain tilth. Terraces and contour farming help to control water erosion.

Potential for most urban uses is medium. Slope, the moderate corrosivity to uncoated steel, and the moderate depth to rock are the main limitations, but they can be easily overcome by good design and careful installation procedures. Potential for most recreational uses is high. Slope and the depth to rock are limitations for playgrounds.

This soil is in capability subclass IVe and the Sandy Loam range site.

37—Hext-Brackett complex, 1 to 8 percent slopes. This complex consists of moderately deep and shallow, gently sloping to sloping soils on uplands. Slopes are slightly convex. Areas are long and narrow to irregular in shape. They range from about 10 to 600 acres.

Hext soils make up about 62 percent of the complex, Brackett soils about 20 percent, and other soils about 18 percent. These soils are so intricately mixed that it is not practical to map them separately.

The Hext soils are moderately deep. They are on slightly convex and less sloping areas in the complex. Typically, they have a surface layer that is friable, moderately alkaline, light brownish gray loam about 8 inches thick. Chalky limestone fragments are widely scattered on the surface. The subsoil extends to a depth of 27 inches. It is friable, moderately alkaline loam that is pale brown to a depth of 24 inches, and below that, it is very pale brown and contains accumulations of calcium carbonate. The underlying material is weakly cemented sandstone, which can be crushed with the fingers, interbedded with calcareous loamy soil.

Hext soils are well drained. Surface runoff is medium. Permeability is moderate, and available water capacity is low.

The Brackett soils are on convex knolls and more sloping areas. Typically, they have a surface layer that is friable, moderately alkaline, brown gravelly clay loam about 8 inches thick. The subsoil is friable, moderately alkaline, very pale brown clay loam about 8 inches thick. It contains about 10 percent, by volume, limestone fragments. The underlying material is thinly bedded, chalky limestone and calcareous soil to a depth of 41 inches.

Brackett soils are well drained. Surface runoff is rapid. Permeability is moderately slow, and available water capacity is very low.

Included in this complex are small areas of Menard, Sunev, Callahan, and Pedernales soils on foot slopes. Also included on ridgetops are a few areas of Tarrant soils.

Hext and Brackett soils are generally too gravelly or too steep for cultivation. The few areas of arable soils are so small and irregularly shaped that cultivation is impractical. These soils are mainly used as rangeland. A few areas are used as improved pastureland.

Potential for native range plants is medium. Low to very low available water capacity and restricted rooting depth limit forage production. The climax plant community is a mixture of tall and mid grasses, forbs, and live oak and Texas oak. Management needs are proper stocking, controlled grazing, and brush management. Potential for wildlife habitat is also medium.

Potential for most urban or recreational uses is medium. Slope, the moderate to shallow depth to bedrock, and the moderately slow permeability of the Brackett soils are the main limitations.

This complex is in capability subclass VIe. Hext soils are in the Sandy Loam range site and Brackett soils are in the Adobe range site.

38—Kavett silty clay, 1 to 3 percent slopes. This shallow, gently sloping soil is on uplands, mainly along slightly convex limestone ridges. Slopes are smooth. Areas are irregular in shape and range from 10 to 100 acres.

Typically, the surface layer is firm, moderately alkaline, brown silty clay about 16 inches thick. Next is a layer of strongly cemented caliche about 3 inches thick. This layer rests on a thick layer of strongly cemented limestone that is coated with caliche (fig. 11).

This soil is well drained. Surface runoff is medium. Permeability is moderately slow. Available water capacity is very low.

Included in some areas of this soil are small areas of Rowena, Speck, and Valera soils. Also included are small areas of soils that are similar to this Kavett soil but do not have cemented caliche in the lower part. These included soils make up less than 20 percent of any mapped area.

This soil can be used for cultivated crops but is mainly used as rangeland. Potential for native range plants is medium, mainly because of a restricted root zone. The climax plant community consists mainly of mid grasses with occasional shrubs and live oak motts. Management needs are proper stocking and controlled grazing. Potential for wildlife habitat is medium.

Potential is low for grain sorghum, oats, and wheat. Keeping crop residue on the surface helps to prevent

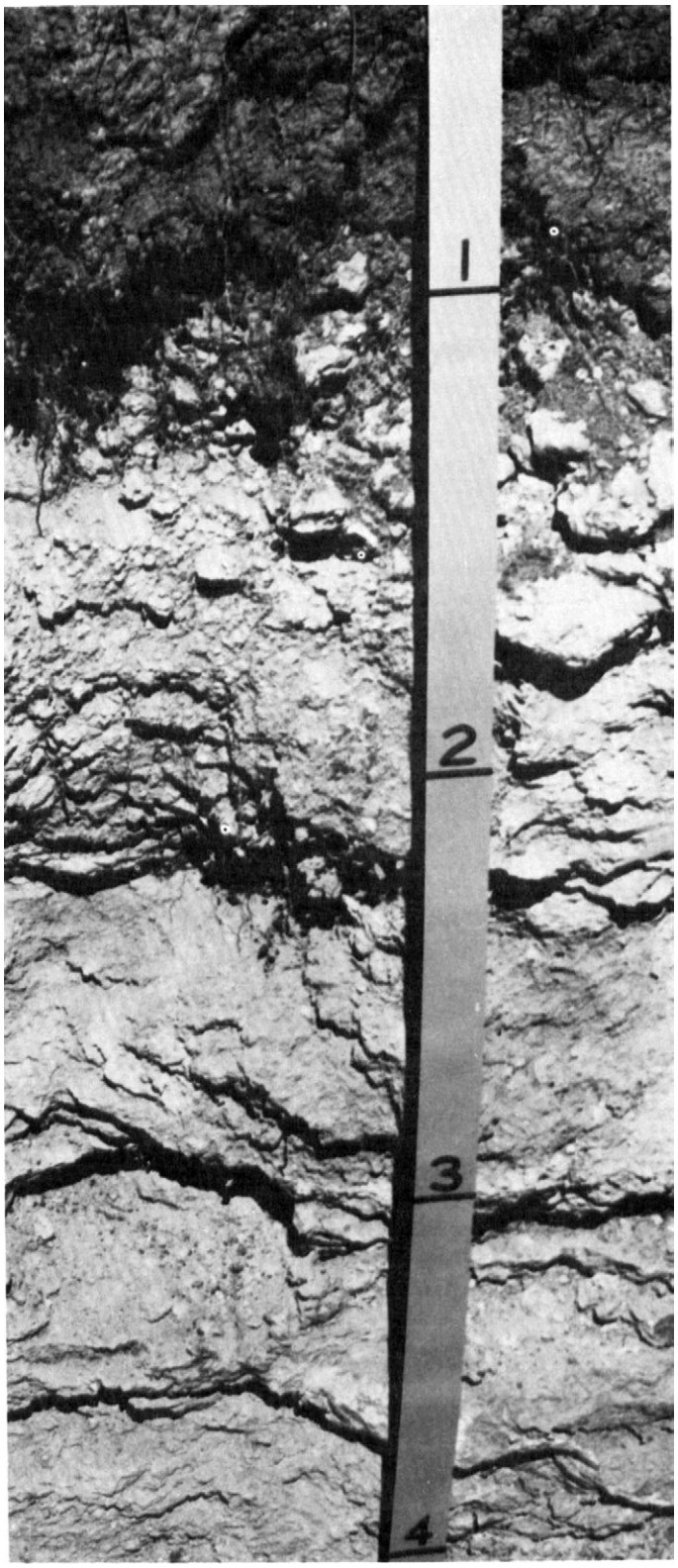


Figure 11.—Profile of Kavett silty clay, 1 to 3 percent slopes, showing underlying limestone.

erosion and conserve moisture. It also helps to improve soil tilth and water intake.

Potential for pasture production is low. Improved grasses such as kleingrass, Coastal bermudagrass, weeping lovegrass, and King Ranch bluestem are suited to this soil.

Potential for most urban uses is low. The shallow depth to bedrock is a limitation that is difficult to overcome. Potential for recreational uses is low because of the clayey surface layer.

This soil is in capability subclass IIIe and the Shallow range site.

39—Krum silty clay, 1 to 3 percent slopes. This deep, gently sloping soil is on upland terraces that are mainly in shallow valleys. Slopes are smooth and slightly concave to plane. Areas are broad to irregular in shape and range from 10 to 750 acres.

Typically, the surface layer is about 34 inches thick. It is firm, moderately alkaline, very dark grayish brown silty clay in the upper 17 inches and very firm, moderately alkaline, dark grayish brown silty clay below a depth of 17 inches. The subsoil to a depth of 68 inches is firm, moderately alkaline, yellowish brown silty clay.

This soil is well drained. Surface runoff is slow to medium. When dry, this soil has cracks that extend from the surface to a depth of more than 24 inches. Permeability is moderately slow. Available water capacity is high.

Included in some areas of this soil are small areas of Leeray, Denton, Bolar, and Frio soils. These included soils make up less than 20 percent of any mapped area.

This soil is mainly used as cropland. Small grain and grain sorghum are the main cultivated crops.

Potential for wheat, oats, grain sorghum, and cotton is high. Crop residue left on or near the surface helps to conserve moisture and maintain tilth and productivity. Contour farming and terraces are needed in most areas to prevent erosion. Grassed waterways make good outlets for terrace systems when excess water is a problem.

Potential for native range plants is high. The climax plant community is mainly a mixture of tall and mid grasses and forbs. Management needs are proper stocking, controlled grazing, and brush management. Potential for wildlife habitat is medium.

Potential for pasture production is high. Improved grasses such as Coastal bermudagrass, kleingrass, and weeping lovegrass are well suited to this soil.

This soil has low potential for most urban or recreational uses. Shrinking and swelling of the soil with changes in moisture, high corrosivity to uncoated steel, and the clayey surface layer are the main limitations.

This soil is in capability subclass IIe and the Clay Loam range site.

40—Leeray clay, 0 to 1 percent slopes. This deep, nearly level soil is on upland plains and in valleys. Slopes are smooth and are slightly concave to plane.

Areas are broad to irregular in shape and range from 10 to 500 acres or more. In undisturbed areas, the surface is characterized by weak gilgai microrelief consisting of microknolls and microdepressions. The microknolls are 3 to 10 inches higher than the bottom of the microdepressions. Evidence of gilgai microrelief is destroyed after a few years of cultivation.

Typically, the surface layer extends to a depth of about 46 inches. It is firm, moderately alkaline, very dark grayish brown clay in the upper 6 inches; firm, moderately alkaline, grayish brown clay with a few slickensides to a depth of 22 inches; and firm, moderately alkaline, grayish brown clay with common slickensides to a depth of 46 inches. The underlying material to a depth of 60 inches is firm, moderately alkaline, brown clay.

This soil is well drained. Surface runoff is slow. When dry, this soil has wide cracks that extend from the surface to a depth of more than 20 inches. When the soil is dry and cracked, water enters rapidly; but when the soil is wet and the cracks are sealed, water enters very slowly. Permeability is very slow. Available water capacity is medium.

Included in some areas of this soil are small areas of Nukrum, Rowena, Sagerton, and Lindy soils. Also included are areas of soils that are similar to this Leeray soil but do not have slickensides. These included soils make up less than 20 percent of any mapped area.

This soil is mainly used as cropland. Small grain and grain sorghum are the main cultivated crops.

Potential for oats, wheat, grain sorghum, and cotton is high. Crop residue left on or near the surface helps to conserve moisture and maintain tilth and productivity.

Potential for native range plants is medium. The climax plant community is mainly a mixture of mid and short grasses. Management needs are proper stocking, controlled grazing, and brush management. Potential for wildlife habitat is medium.

Potential for pasture production is medium. Improved grasses such as Coastal bermudagrass and kleingrass are suited to this soil.

This soil has low potential for most urban or recreational uses. Shrinking and swelling of the soil with changes in moisture, high corrosivity to uncoated steel, very slow permeability, and the clayey surface layer are the main limitations.

This soil is in capability subclass IIIs and the Clay Loam range site.

41—Leeray clay, 1 to 3 percent slopes. This deep, gently sloping soil is on uplands. Slopes are slightly convex. Areas are irregular in shape and range from 10 to 500 acres. In undisturbed areas, the surface is characterized by weak gilgai microrelief consisting of microknolls and microdepressions. The microknolls are 3 to 10 inches higher than the microdepressions. Evidence of gilgai microrelief is destroyed after a few years of cultivation.

Typically, the surface layer extends to a depth of about 48 inches. To a depth of 26 inches, it is firm and very firm, moderately alkaline, dark grayish brown clay that has a few slickensides in the lower part. Below that, it is very firm, moderately alkaline, brown clay that has common slickensides. The underlying material to a depth of 56 inches is very firm, moderately alkaline, brownish yellow clay.

This soil is well drained. Surface runoff is medium. When dry, this soil has wide cracks that extend from the surface to a depth of more than 20 inches. When the soil is dry and cracked, water enters rapidly; but when the soil is wet and the cracks are sealed, water enters very slowly. Permeability is very slow. Available water capacity is medium.

Included in some areas of this soil are small areas of Nukrum, Rowena, and Sagerton soils. Also included are areas of soils that are similar to this Leeray soil but do not have slickensides. A few very small areas have limestone bedrock at a depth of about 40 inches. These included soils make up less than 20 percent of any mapped area.

This soil is mainly used as cropland. Small grain and grain sorghum are the main cultivated crops.

Potential for wheat, oats, grain sorghum, and cotton is high. Crop residue left on or near the surface helps to conserve moisture and maintain tilth and productivity. Contour farming and terraces are needed in most areas to prevent erosion. Grassed waterways make good outlets for terrace systems when excess water is a problem.

Potential for native range plants is medium. The climax plant community is mainly a mixture of tall and mid grasses and forbs. Management needs are proper stocking, controlled grazing, and brush management. Potential for wildlife habitat is medium.

Potential for pasture production is medium. Improved grasses such as Coastal bermudagrass and kleingrass are suited to this soil.

This soil has low potential for most urban or recreational uses. Shrinking and swelling of the soil with changes in moisture, high corrosivity to uncoated steel, very slow permeability, and the clayey surface layer are the main limitations.

This soil is in capability subclass IIIe and the Clay Loam range site.

42—Lindy clay loam, 1 to 3 percent slopes. This moderately deep, gently sloping soil is on uplands, mainly along slightly convex ridges. Areas are irregular in shape and range from 10 to 200 acres or more.

Typically, the surface layer is firm, mildly alkaline, brown clay loam about 6 inches thick. The subsoil is very firm, mildly alkaline, reddish brown clay to a depth of about 28 inches. Below that is coarsely fractured, strongly cemented limestone.

This soil is well drained. Surface runoff is medium. Permeability is slow. Available water capacity is low.

Included in some areas of this soil are small areas of Speck soils. Also included are a few areas of soils that are similar to this Lindy soil, except they have carbon-

ates within a depth of 28 inches. These included soils make up less than 25 percent of any mapped area.

This soil can be used for cultivated crops but is mainly used as rangeland. Potential for native range plants is high. The climax plant community is a mixture of tall and mid grasses, forbs, and occasional shrubs and live oak trees. Management needs are proper stocking, controlled grazing, and brush management. Potential for wildlife habitat is also high.

Potential for oats and grain sorghum is high. Keeping crop residue on or near the surface helps to prevent erosion and conserve moisture. It also helps to improve soil tilth and water intake. Contour farming and terraces are needed in most areas to prevent erosion. Where cuts or excavations exceed a depth of 28 inches, there is a hazard of cutting into a bed of strongly cemented limestone.

Potential for pasture production is medium. Improved grasses such as kleingrass, Coastal bermudagrass, weeping lovegrass, and King Ranch bluestem are suited to this soil.

Potential for most urban or recreational uses is medium. The moderate depth to rock and shrinking and swelling of the soil with changes in moisture restrict some uses.

This soil is in capability subclass IIIe and the Deep Redland range site.

43—May fine sandy loam, 0 to 1 percent slopes. This deep, nearly level soil is in shallow valleys on uplands. Slopes are smooth and slightly concave. Areas are oblong to irregular in shape and range from 10 to 400 acres.

Typically, the surface layer is friable, neutral, brown fine sandy loam about 14 inches thick. The subsoil is firm, neutral and mildly alkaline, brown sandy clay loam to a depth of about 48 inches. The underlying material to a depth of 80 inches is firm, moderately alkaline, light gray sandy clay loam.

This soil is well drained. Surface runoff is slow. Permeability is moderate, and available water capacity is high.

Included in some areas of this soil are small areas of Cisco, Menard, Abilene, and Pedernales soils. These included soils make up less than 15 percent of any mapped area.

This soil is mainly used as cropland or improved pastureland. Small grain and forage sorghums are the main crops, but other crops are grown.

Potential for oats, wheat, grain sorghum, forage sorghum, and peanuts is high. Crop residue left on or near the surface helps to conserve moisture and maintain tilth and productivity (fig. 12).

This soil has high potential for pasture production. Introduced grasses such as kleingrass, Coastal bermudagrass, and weeping lovegrass are well suited to this soil.

Potential for native range plants is high. The climax plant community is a mixture of tall and mid grasses, forbs, and oak trees. Management needs are proper stocking, controlled grazing, and brush management. Potential for wildlife habitat is also high.

Potential for most urban uses is medium. Shrinking and swelling of the soil with changes in moisture and high corrosivity to uncoated steel are the main limitations. Potential for most recreational uses is high.

This soil is in capability class I and the Sandy Loam range site.

44—May fine sandy loam, 1 to 3 percent slopes. This deep, gently sloping soil is in shallow valleys on uplands. Slopes are smooth and concave. Areas are oblong to irregular in shape and range from 10 to 80 acres or more.

Typically, the surface layer is friable, neutral, brown fine sandy loam about 12 inches thick. The subsoil is firm, mildly alkaline, brown sandy clay loam to a depth of about 44 inches. The underlying material to a depth of 60 inches is firm, moderately alkaline, light gray sandy clay loam.

This soil is well drained. Surface runoff is slow. Permeability is moderate, and available water capacity is high. This soil has good tilth and can be worked throughout a wide range of moisture conditions.

Included in some areas of this soil are small areas of Cisco, Menard, Abilene, and Pedernales soils. These included soils make up less than 15 percent of any mapped area.

This soil is mainly used as cropland. Small grain, forage sorghum, and peanuts are the main cultivated crops.

Potential for grain sorghum, oats, peanuts, and forage sorghum is high. Keeping crop residue on the surface helps to conserve moisture, control wind erosion, and maintain tilth. Terraces and contour farming help to control water erosion. Peaches, apples, and melons are also well suited to this soil.

Potential for native range plants is high. The climax plant community is a mixture of tall and mid grasses, forbs, and oak trees. Management needs are proper stocking, controlled grazing, and brush management. Potential for wildlife habitat is also high.

Potential for pasture production is high. Introduced grasses such as Coastal bermudagrass, kleingrass, and weeping lovegrass are well suited to this soil.

Potential for most urban uses is medium. Shrinking and swelling of the soil with changes in moisture and high corrosivity to uncoated steel are the main limitations, but they can be overcome by good design and careful installation procedures. Potential for most recreational uses is high.

This soil is in capability subclass IIe and the Sandy Loam range site.

45—Menard fine sandy loam, 1 to 3 percent slopes. This deep, gently sloping soil is on uplands. Slopes are smooth. Areas are irregular in shape and range from 10 to 200 acres or more.

Figure 12.—Irrigated peanuts on May fine sandy loam, 0 to 1 percent slopes.

Typically, the surface layer is friable, neutral, brown fine sandy loam about 8 inches thick. The subsoil extends to a depth of 30 inches. It is friable, moderately alkaline sandy clay loam that is reddish brown to a depth of 22 inches. Below that, it is brown and contains accumulations of calcium carbonate. The underlying material to a depth of 60 inches is friable, moderately alkaline, yellowish brown sandy clay loam that contains accumulations of calcium carbonate.

This soil is well drained. Surface runoff is medium. Permeability is moderate, and available water capacity is high. It has good tilth and can be worked throughout a wide range of moisture conditions.

Included in some areas of this soil are small areas of Pedernales, Cisco, May, and Hext soils. These included soils make up less than 15 percent of any mapped area.

This soil is mainly used as cropland. Potential for peanuts is high and for oats and grain sorghum is medium. Terraces and contour farming help to control erosion. Crop residue left on or near the surface helps to conserve moisture and maintain tilth and productivity.

Potential for pasture production is high. Improved grasses such as weeping lovegrass, Coastal bermudagrass, and kleingrass are well suited to this soil.

Potential for native range plants is high. The climax plant community is a mixture of tall and mid grasses, forbs, and live oak trees. Management needs are proper stocking, controlled grazing, and brush management. Potential for wildlife habitat is also high.

This soil has high potential for most urban or recreational uses. Slope is a limitation for playgrounds.

This soil is in capability subclass IIe and the Sandy Loam range site.

46—Menard fine sandy loam, 3 to 5 percent slopes. This deep, gently sloping soil is on uplands and foot slopes. Slopes are smooth and convex. Areas are irregular to elongated in shape and range from 10 to 200 acres or more.

Typically, the surface layer is friable, neutral, brown fine sandy loam about 10 inches thick. The subsoil extends to a depth of 48 inches. It is firm, neutral, reddish brown sandy clay loam to a depth of about 18 inches; firm, mildly alkaline, yellowish red sandy clay loam to a depth of about 36 inches; and below that, is friable,

moderately alkaline, reddish yellow sandy clay loam that contains accumulations of calcium carbonate. The underlying material to a depth of 60 inches is moderately alkaline, yellow loam that contains accumulations of calcium carbonate.

This soil is well drained. Surface runoff is medium. Permeability is moderate, and available water capacity is high. This soil has good tilth and can be worked throughout a wide range of moisture conditions.

Included in some areas of this soil are small areas of Pedernales, Cisco, and Hext soils. These included soils make up less than 15 percent of any mapped area.

This soil is suitable for cultivation but is mainly used as pastureland and rangeland. Potential for native range plants is high. The climax plant community is a mixture of tall and mid grasses, forbs, and live oak trees. Management needs are proper stocking, controlled grazing, and brush management. Potential for wildlife habitat is also high.

Potential for pasture production is medium. Improved grasses such as Coastal bermudagrass, kleingrass, and weeping lovegrass are well suited to this soil.

Potential for peanuts, grain sorghum, and small grain is medium. Keeping crop residue on the surface helps to conserve moisture, control wind erosion, and maintain tilth. Terraces and contour farming help to control water erosion.

Potential for most urban and recreational uses is high. Slope is a limitation for playgrounds.

This soil is in capability subclass IIIe and the Sandy Loam range site.

47—Menard fine sandy loam, 2 to 5 percent slopes, eroded. This deep, gently sloping soil is on uplands. Slopes are smooth. Many areas have shallow gullies and eroded areas at intervals of 50 to 300 yards. The gullies are generally 1 foot to 3 feet deep and 5 to 15 feet wide. Some areas have deeper gullies on lower slopes where water is concentrated. Areas are irregular in shape and range from 10 to 200 acres or more.

Typically, the surface layer is friable, neutral, brown fine sandy loam about 6 inches thick. The subsoil extends to a depth of 36 inches. It is firm, neutral, reddish brown sandy clay loam to a depth of about 18 inches; firm, neutral, yellowish red sandy clay loam to a depth of about 29 inches; and below that, is firm, moderately alkaline, strong brown sandy clay loam that contains accumulations of calcium carbonate. The underlying material to a depth of 60 inches is moderately alkaline, yellowish red sandy clay loam that contains accumulations of calcium carbonate.

This soil is well drained. Surface runoff is medium. Permeability is moderate, and available water capacity is high.

Included in some areas of this soil are small areas of Pedernales, Cisco, and Hext soils. These included soils make up less than 20 percent of any mapped area.

This soil is suitable for cultivation but is mainly used as pastureland and rangeland.

Potential for pasture production is medium. Improved grasses such as Coastal bermudagrass, kleingrass, and weeping lovegrass are well suited to this soil.

Potential for native range plants is high. The climax plant community is a mixture of tall and mid grasses, forbs, and oak trees. Management needs are proper stocking, controlled grazing, and brush management. Potential for wildlife habitat is also high.

Potential for grain sorghum and small grain is medium. Keeping crop residue on the surface helps to conserve moisture, control wind erosion, and maintain tilth. Terraces and contour farming help to control water erosion.

Potential for most urban and recreational uses is high. Slope is a limitation for playgrounds.

This soil is in capability subclass IIIe and the Sandy Loam range site.

48—Menard fine sandy loam, 5 to 8 percent slopes. This deep, sloping soil is on uplands. Slopes are smooth and convex. Areas are irregular to long and narrow in shape and range from 10 to several hundred acres.

Typically, the surface layer is friable, neutral, brown fine sandy loam about 5 inches thick. The subsoil extends to a depth of 34 inches. It is firm, mildly alkaline, reddish brown sandy clay loam to a depth of about 26 inches and friable, moderately alkaline, reddish yellow sandy clay loam below 26 inches. The underlying material to a depth of 48 inches is friable, moderately alkaline, reddish yellow sandy clay loam that contains accumulations of calcium carbonate.

This soil is well drained. Surface runoff is medium. Permeability is moderate, and available water capacity is high. The hazard of erosion is severe.

Included in some areas of this soil are small areas of Pedernales and Hext soils on upper slopes. Also included are small areas of Cisco soils. In some areas the surface layer has been removed by sheet erosion. Some areas contain a few gullies. These included soils make up less than 20 percent of any mapped area.

This soil can be used for cultivated crops, but is mainly used as rangeland. Potential for native plants is high. The climax plant community is a mixture of tall and mid grasses, forbs, and live oak trees. Management needs are proper stocking, controlled grazing, and brush management. Potential for wildlife habitat is also high.

Potential for grain sorghum is low and for oats is medium. Terraces and contour farming help to control erosion. Crop residue left on or near the surface helps to conserve moisture and maintain tilth and productivity.

Potential for pasture production is medium. Improved grasses such as weeping lovegrass, Coastal bermudagrass, and kleingrass are well suited to this soil.

This soil has high potential for most urban and recreational uses. Slope is a limitation for playgrounds.

This soil is in capability subclass IVe and the Sandy Loam range site.

49—Menard-Hext association, gently undulating. This association consists of deep and moderately deep soils on uplands. Slopes are smooth and are 1 to 5 percent. Areas are irregular in shape and range from 10 to more than 200 acres.

Menard soils make up about 45 percent of the association, Hext soils about 40 percent, and other soils about 15 percent. The composition of this map unit is more variable than that of most of the other map units in the survey area; however, the composition has been controlled well enough so that the map unit can be interpreted for the expected uses of the soils.

The Menard soils are deep. They are on lower slopes. Typically, they have a surface layer that is friable, slightly acid, brown fine sandy loam about 4 inches thick. The subsoil extends to a depth of 35 inches. It is firm, mildly alkaline sandy clay loam that is red to a depth of 23 inches and reddish yellow below 23 inches. The underlying material to a depth of 45 inches is friable, moderately alkaline, pinkish gray loam that contains accumulations of calcium carbonate. Below that, to a depth of 60 inches, the underlying material is weakly cemented, moderately alkaline, yellow sandstone.

Menard soils are well drained. Surface runoff is medium. Permeability is moderate, and available water capacity is high.

The Hext soils are moderately deep. They are on ridgetops and slight knolls. Typically, they have a surface layer that is friable, moderately alkaline, dark brown loam about 7 inches thick. The subsoil is friable, moderately alkaline, reddish brown loam to a depth of 32 inches. The underlying material to a depth of 72 inches is weakly cemented sandstone and limy earth.

Hext soils are well drained. Surface runoff is slow. Permeability is moderate, and available water capacity is low. The hazard of erosion is moderate.

Included in this association are areas of Cisco, Brackett, and Doudle soils. A few small areas of Pedernales soils are included in some places. Also included are small eroded areas where sheet erosion or shallow gullies have removed most of the surface layer.

These Menard and Hext soils can be used for cultivated crops, but are mainly used as rangeland or improved pastureland. Potential for native range plants is medium. The climax plant community is a mixture of tall and mid grasses, forbs, and live oak trees. Management needs are proper stocking, controlled grazing, and brush management. Potential for wildlife habitat is high.

Potential for oats and grain sorghum is medium. Crop residue left on or near the surface helps to conserve moisture and maintain tilth and productivity. Contour farming and terraces are needed in most areas to prevent erosion. Where cuts or excavations exceed a depth of 20 to 40 inches in the Hext soils, there is a hazard of cutting into the underlying sandstone.

Potential for pasture production is medium. Improved grasses such as kleingrass, Coastal bermudagrass, and weeping lovegrass are suited to these soils.

These soils have medium potential for most urban uses and high potential for most recreational uses. Slope and the moderate depth to rock of the Hext soils restrict some uses.

This association is in capability subclass IVe and the Sandy Loam range site.

50—Mereta clay loam, 1 to 3 percent slopes. This shallow, gently sloping soil is on uplands, mainly along slightly convex ridges. Slopes are smooth. Areas are elongated to irregular in shape and range from 10 to 150 acres or more.

Typically, the surface layer is firm, moderately alkaline, brown clay loam about 18 inches thick. Next is a layer of strongly cemented pink caliche about 13 inches thick. Below that, to a depth of 46 inches, the underlying material is friable, moderately alkaline, light red loam (fig. 13).

This soil is well drained. Surface runoff is slow. Permeability is moderately slow. Available water capacity is low.

Included in some areas of this soil are very small areas of Nuvalde, Doudle, and Speck soils and small areas of a soil that is similar to this Mereta soil but does not have a layer of strongly cemented caliche within a depth of 20 inches. These included soils make up less than 25 percent of any mapped area.

This soil can be used for cultivated crops but is mainly used as rangeland. Potential for native range plants is medium, mainly because of the restricted root zone. The climax plant community consists mainly of mid grasses with occasional shrubs and live oak motts. Management needs are proper stocking and controlled grazing. Potential for wildlife habitat is medium.

This soil has low potential for oats, wheat, and grain sorghum. Keeping crop residue on the surface helps to prevent erosion and conserve moisture. It also helps to improve soil tilth and water intake.

Potential for pasture production is low. Improved grasses such as kleingrass, Coastal bermudagrass, and King Ranch bluestem are suited to this soil.

Potential for most urban and recreational uses is medium. The shallow depth to hard caliche and the shrinking and swelling of the soil with changes in moisture are the main limitations.

This soil is in capability subclass IIIe and the Shallow range site.

51—Miller silty clay, occasionally flooded. This deep, nearly level soil is on flood plains. Slopes are smooth to weakly concave and are 0 to 1 percent. Most areas of this soil are subject to flooding about once in 2 to 5 years. Areas are long and narrow and range from 10 to 130 acres.

Typically, the surface layer is firm, moderately alkaline, reddish brown silty clay about 17 inches thick. The sub-

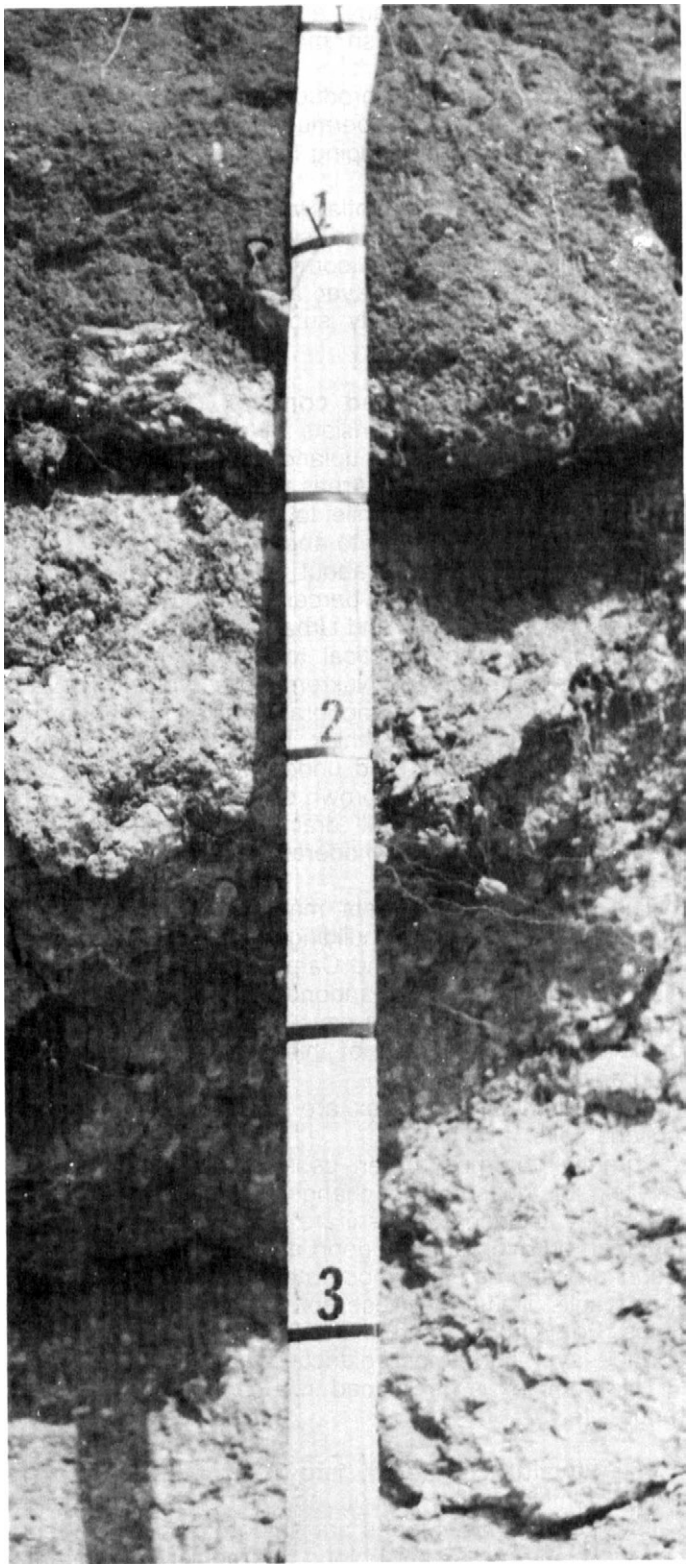


Figure 13.—Profile of Mereta clay loam, 1 to 3 percent slopes, showing the petrocalcic horizon or hard caliche layer under the surface layer.

soil to a depth of 48 inches is very firm, moderately alkaline, reddish brown silty clay. The underlying material to a depth of 80 inches is firm, moderately alkaline, reddish brown silty clay.

This soil is moderately well drained. Surface runoff is slow. Permeability is very slow, and available water capacity is high.

Included in some areas of this soil are a few areas of Clairemont soils and a soil similar to Clairemont soils, except it has an average clay content of less than 18 percent. These included soils are on slightly convex areas and make up less than 15 percent of any mapped area.

This soil is mainly used as rangeland and pastureland. Small grain and grain sorghum are the main cultivated crops. Pecans are also suited to this soil.

Potential for wheat, oats, forage sorghum, and grain sorghum is high. Tillage should be timely and kept to a minimum. Crop residue left on or near the surface helps to conserve moisture and maintain tilth and productivity.

Potential for pasture production is high. Pasture grasses such as johnsongrass, Coastal bermudagrass, and kleingrass are well suited to this soil.

Potential for native range plants is high. The climax plant community is a mixture of tall and mid grasses, forbs, and scattered shrubs and trees. Management needs are proper stocking, controlled grazing, and brush management. Potential for wildlife habitat is medium.

This soil has low potential for most urban or recreational uses. Flooding is a severe limitation that is very difficult to overcome.

This soil is in capability subclass IIIw and the Clayey Bottomland range site.

52—Nimrod fine sand, 0 to 5 percent slopes. This deep, nearly level to gently sloping soil is on uplands. Slopes are plane to slightly convex. Areas are irregular to broad in shape and range from 10 to 200 acres.

Typically, the surface layer is very friable, slightly acid fine sand about 30 inches thick. It is pale brown in the upper 10 inches and very pale brown in the lower 20 inches. The subsoil extends to a depth of 66 inches. To a depth of 46 inches, it is firm, medium acid, light gray, sandy clay loam that has red and strong brown mottles. Below that, it is medium acid, brownish yellow sandy clay loam that has coarse mottles of light brownish gray and red. The underlying material to a depth of 80 inches is firm, medium acid, light brownish gray fine sandy loam that has common coarse red mottles.

This soil is moderately well drained. Surface runoff is slow. Permeability is moderately slow. Available water capacity is medium. The hazard of wind erosion is severe. From May through October for short periods following heavy rainfall, this soil has a perched water table at a depth of 1.5 to 3.5 feet.

Included in some areas of this soil are small areas of Chaney, Patilo, Pedernales, and Cisco soils. Also included are soils that are similar to this Nimrod soil but do not

have gray mottles in the subsoil. A few areas have slopes of 5 to 8 percent, but they are mainly short hills or dunes of minor extent. These included soils make up less than 30 percent of any mapped area.

This soil is mainly used as cropland. Peanuts is the main cultivated crop.

Potential for peanuts is high. Potential for grain sorghum and oats is medium. Keeping crop residue on the surface helps to conserve moisture, control wind erosion, and maintain tilth. Rye and vetch are commonly grown as a winter cover crop.

Potential for pasture production is high. Improved grasses such as Coastal bermudagrass and weeping lovegrass are well suited to this soil.

Potential for native range plants is medium. The climax plant community is a mixture of tall and mid grasses, forbs, and oak trees. Management needs are proper stocking, controlled grazing, and brush management. Potential for wildlife habitat is high.

Potential for most urban uses is medium. Wetness, high corrosivity to uncoated steel, and the loose sandy surface layer are the main limitations, but they can be overcome by good design and careful installation procedures. Potential for most recreational uses is low because of the sandy surface layer.

This soil is in capability subclass IIIe and the Sandy range site.

53—Nukrum silty clay, 1 to 3 percent slopes. This deep, gently sloping soil is on uplands on terraces that are mainly in valley positions. Slopes are smooth and slightly concave to plane. Areas are long and narrow to irregular in shape and range from 10 to 450 acres.

Typically, the surface layer is firm, moderately alkaline, dark grayish brown silty clay about 24 inches thick. The subsoil to a depth of 56 inches is firm, moderately alkaline, grayish brown silty clay. The underlying material to a depth of 72 inches is firm, moderately alkaline, brown silty clay loam.

This soil is well drained. Surface runoff is medium. When dry, this soil has cracks that extend from the surface to a depth of more than 20 inches. Permeability is moderately slow. Available water capacity is high.

Included in some areas of this soil are small areas of Leeray, Rowena, Sagerton, Callahan, Nuvalde, and Frio soils. These included soils make up less than 20 percent of any mapped area.

This soil is used as cropland, pastureland, and rangeland. Small grain and grain sorghum are the main cultivated crops.

Potential for oats, wheat, grain sorghum, and cotton is high. Crop residue left on or near the surface helps to conserve moisture and maintain tilth and productivity. Contour farming and terraces are needed in most areas to prevent erosion. Grassed waterways make good outlets for terrace systems when excess water is a problem.

Potential for native range plants is medium. The climax plant community consists mainly of mid grasses and forbs. Management needs are proper stocking, controlled grazing, and brush management. Potential for wildlife habitat is medium.

Potential for pasture production is high. Introduced grasses such as Coastal bermudagrass, kleingrass, King Ranch bluestem, and weeping lovegrass are well suited to this soil.

This soil has low potential for most urban or recreational uses. Shrinking and swelling of the soil with changes in moisture, high corrosivity to uncoated steel, and the clayey surface layer are the main limitations.

This soil is in capability subclass IIe and the Clay Loam range site.

54—Nukrum-Urban land complex, 1 to 4 percent slopes. This complex consists of deep, gently sloping soils and Urban land on uplands on terraces that are mainly in valley positions. Areas range from 200 to 1,800 feet wide and from 0.5 mile to 1.5 miles long in most places. They range from 8 to about 260 acres.

Nukrum soils make up about 30 percent of the complex, Urban land about 60 percent, and other soils about 10 percent. These soils and Urban land are so intricately mixed that it is not practical to map them separately.

Undisturbed areas of Nukrum soils typically have a surface layer that is firm, moderately alkaline, dark brown silty clay about 40 inches thick. Below this to a depth of 80 inches, the subsoil and underlying material are very firm, moderately alkaline, brown silty clay.

Nukrum soils are well drained. Surface runoff is medium. Permeability is moderately slow, and available water capacity is high.

The Urban land consists mainly of streets, parking areas, houses, railroads, buildings, and a cemetery. Part of the Urban land is in the Camp Bowie area and consists of remnants of abandoned streets and building foundations and spots that have 6 to 10 inches of gravel or caliche material. Much of this area has been altered by grading and shaping.

Included in this complex are areas of Sagerton and Abilene soils.

Potential for most urban uses is low. Shrinking and swelling of the soil with changes in moisture and high corrosivity to uncoated steel are the main limitations, but they can be overcome by good design and careful installation procedures. The moderately slow permeability of these soils limits their use for septic tank absorption fields. Potential for recreational uses is low. The clayey surface layer is the most restrictive feature.

This complex is not placed in a capability subclass or range site.

55—Nuvalde clay loam, 1 to 3 percent slopes. This deep, gently sloping soil is on plains and in shallow valleys on uplands. Slopes are smooth and slightly concave to plane. Areas are oblong to irregular in shape and range from 10 to 700 acres.

Typically, the surface layer is friable, moderately alkaline, brown clay loam about 10 inches thick. The subsoil

to a depth of 32 inches is firm, moderately alkaline, brown clay loam. The underlying material to a depth of 60 inches is friable, moderately alkaline, pink clay loam that contains more than 40 percent calcium carbonate.

This soil is well drained. Surface runoff is slow. Permeability is moderate, and available water capacity is high.

Included in some areas of this soil are areas of Rowena, Sunev, Nukrum, Winters, Abilene, and Sagerton soils. Also included are areas where the subsoil extends to a depth of more than 40 inches. These included soils make up less than 20 percent of any mapped area.

This soil is mainly used as cropland or improved pastureland. Small grain and forage sorghums are the main crops, but other crops are grown.

This soil has medium potential for wheat, grain sorghum, forage sorghum, and cotton and high potential for oats. Terraces and contour farming help to control erosion. Crop residue left on or near the surface helps to conserve moisture and maintain tilth and productivity.

This soil has medium potential for pasture production. Improved grasses such as kleingrass, Coastal bermudagrass, King Ranch bluestem, and weeping lovegrass are suited to this soil.

Potential for native range plants is medium. The climax plant community consists mainly of mid grasses. Management needs are proper stocking, controlled grazing, and brush management. Potential for wildlife habitat is medium.

Potential for most urban uses is low. Shrinking and swelling of the soil with changes in moisture and high corrosivity to uncoated steel are the main limitations. Potential for most recreational uses is medium because of the high content of clay in the surface layer.

This soil is in capability subclass IIe and the Clay Loam range site.

56—Patilo fine sand, 1 to 5 percent slopes. This deep, gently sloping soil is on uplands. Slopes are convex and average about 4 percent. Areas are smooth to dunelike in appearance and range from 10 to about 300 acres.

Typically, the surface layer is loose fine sand that extends to a depth of about 48 inches. The fine sand is neutral and brown in the upper 8 inches and slightly acid and very pale brown below a depth of 8 inches. The subsoil to a depth of 68 inches is very firm, slightly acid sandy clay loam that is mottled in shades of gray and red.

This soil is moderately well drained. Surface runoff is slow. Permeability is moderately slow, and available water capacity is low. The hazard of wind erosion is severe. From May through October for short periods following heavy rainfall, this soil has a perched high water table at a depth of 3 to 6 feet.

Included in some areas of this soil are small areas of Nimrod soils. Also included is a soil that is similar to this Patilo soil, except that it has a higher content of clay in the subsoil. Most cultivated fields are bordered with built-up fence rows of wind-deposited sand that is several feet thick.

This soil is suitable for cultivation, but is mainly used as rangeland or pastureland. Potential for native range plants is medium. The climax plant community is a mixture of tall and mid grasses, greenbrier, and oak trees. Management needs are proper stocking, controlled grazing, and brush management. Potential for wildlife habitat is also medium.

Potential for peanuts and grain sorghum is medium. Crop residue left on the surface helps to conserve moisture, control wind erosion, and maintain tilth.

Potential for pasture production is medium. Improved grasses such as weeping lovegrass and Coastal bermudagrass are suited to this soil.

This soil has medium potential for most urban uses. Wetness and the loose sandy surface layer are the main limitations, but they can be overcome by good design and careful installation procedures. Potential for most recreational uses is low because of the sandy surface layer.

This soil is in capability subclass IIIe and the Deep Sand range site.

57—Pedernales loamy fine sand, 1 to 5 percent slopes. This deep, gently sloping soil is on uplands. Slopes are slightly convex and smooth and average about 2 percent. Areas are irregular in shape and range from 10 to several hundred acres.

Typically, the surface layer is very friable, slightly acid loamy fine sand about 16 inches thick. It is brown in the upper 10 inches and light brown in the lower 6 inches. The subsoil is firm, moderately alkaline sandy clay to a depth of 44 inches. It is red to a depth of 36 inches and reddish yellow below. The underlying material to a depth of 60 inches is firm, moderately alkaline, pink sandy clay loam.

This soil is well drained. Surface runoff is medium. Permeability is moderately slow, and available water capacity is high.

Included in some areas of this soil are areas of Chaney soils and a few very small areas of soils that have a sandy surface layer thicker than 20 inches. Also included are a few areas that have slopes of more than 5 percent. Small eroded areas are in some old cultivated fields. Sheet erosion by wind and water occurs on the upper slopes and convex areas. These eroded areas have a thin surface layer of loamy fine sand that is redder because it has been mixed with material from the subsoil by tillage. Included soils make up less than 20 percent of any mapped area.

Most areas of this soil are cultivated or used as pastureland. The main crops are peanuts and grain sorghum.

Potential for peanuts is high, and potential for grain sorghum is medium. Keeping crop residue on the surface helps to conserve moisture, control wind erosion, and maintain tilth. Contour farming and terraces are needed

in most areas to prevent water erosion. Peaches, apples, and melons are suited to this soil.

Potential for pasture production is high. Introduced grasses such as Coastal bermudagrass and weeping lovegrass are well suited to this soil.

Potential for native range plants is high. The climax plant community is a mixture of tall and mid grasses, forbs, and oak trees. Management needs are proper stocking, controlled grazing, and brush management. Potential for wildlife habitat is also high.

Potential for most urban or recreational uses is medium. Shrinking and swelling of the soil with changes in moisture, the moderately slow permeability, and the sandy surface layer are the main limitations.

This soil is in capability subclass IIIe and the Loamy Sand range site.

58—Pedernales fine sandy loam, 1 to 3 percent slopes. This deep, gently sloping soil is on uplands. Slopes are slightly convex and smooth. Areas are irregular in shape and range from 10 to several hundred acres.

Typically, the surface layer is friable, neutral, brown fine sandy loam about 14 inches thick. The subsoil extends to a depth of 37 inches. It is very firm, mildly alkaline, reddish brown sandy clay to a depth of 29 inches and very firm, moderately alkaline, reddish brown clay below 29 inches. The underlying material to a depth of 60 inches is firm, moderately alkaline, reddish yellow sandy clay loam.

This soil is well drained. Surface runoff is medium. Permeability is moderately slow, and available water capacity is high.

Included in some areas of this soil are areas of Abilene, Callahan, Cisco, Winters, Rochelle, Menard, and Chaney soils. The included soils make up less than 15 percent of any mapped area.

This soil is used as cropland, rangeland, and pastureland. The main crops are oats, peanuts, grain sorghum, and forage sorghum (fig. 14).

Potential for peanuts, grain sorghum, and forage sorghum is medium. Keeping crop residue on the surface helps to conserve moisture, control wind erosion, and maintain tilth. Terraces and contour farming help to control water erosion. Peaches and apples are suited to this soil.

Potential for native range plants is medium. The climax plant community is a mixture of tall and mid grasses, forbs, and oak trees. Management needs are proper stocking, controlled grazing, and brush management. Potential for wildlife habitat is high.

Potential for pasture production is medium. Pasture grasses such as kleingrass, weeping lovegrass, and Coastal bermudagrass are well suited to this soil.

Potential for most urban or recreational uses is medium. Shrinking and swelling of the soil with changes in moisture, the moderately slow permeability, and the clayey subsoil are the main limitations. The limitations can be overcome by proper design and careful installation procedures.

This soil is in capability subclass IIe and the Tight Sandy Loam range site.

59—Pedernales fine sandy loam, 3 to 5 percent slopes. This deep, gently sloping soil is on uplands. Slopes are convex and smooth. Areas are irregular in shape and range from 10 to several hundred acres.

Typically, the surface layer is friable, neutral, brown fine sandy loam about 11 inches thick. The subsoil extends to a depth of 42 inches. It is very firm, neutral, reddish brown clay to a depth of 25 inches and firm, moderately alkaline, reddish brown clay loam below 25 inches. The underlying material to a depth of 60 inches is firm, moderately alkaline, pink sandy clay loam.

This soil is well drained. Surface runoff is medium. Permeability is moderately slow, and available water capacity is high.

Included in some areas of this soil are areas of Callahan, Menard, Cisco, and Winters soils. These included soils make up less than 20 percent of any mapped area.

This soil is suitable for cultivation but is mainly used as rangeland and pastureland. Potential for native range plants is medium. The climax plant community is a mixture of tall and mid grasses, forbs, and oak trees. Management needs are proper stocking, controlled grazing, and brush management. Potential for wildlife habitat is high.

Potential for pasture production is medium. Improved grasses such as King Ranch bluestem, kleingrass, weeping lovegrass, and Coastal bermudagrass are well suited to this soil.

This soil has medium potential for forage sorghum, grain sorghum, and wheat and high potential for oats. Keeping crop residue on the surface helps to conserve moisture, control wind erosion, and maintain tilth. Terraces and contour farming help to control water erosion.

Potential for most urban or recreational uses is medium. Shrinking and swelling of the soil with changes in moisture, the moderately slow permeability, and the clayey subsoil are the main limitations. These limitations can be overcome by proper design and careful installation procedures.

This soil is in capability subclass IIIe and the Tight Sandy Loam range site.

60—Pedernales fine sandy loam, 2 to 5 percent slopes, eroded. This deep, gently sloping soil is on uplands. Slopes are slightly convex and smooth. Sheet erosion has removed 25 to 75 percent of the original surface layer, and shallow gullies with sloping sides are at intervals of 50 to 200 feet in most areas. Areas are irregular in shape and range from 10 to several hundred acres.

Typically, the surface layer is friable, moderately alkaline, reddish brown fine sandy loam about 6 inches thick. The subsoil is very firm, moderately alkaline, reddish brown clay to a depth of about 38 inches. The underlying material to a depth of 80 inches is very firm, moderately alkaline, reddish brown sandy clay.

Figure 14.—Forage sorghum in a field of Pedernales fine sandy loam, 1 to 3 percent slopes.

This soil is well drained. Surface runoff is medium. Permeability is moderately slow, and available water capacity is high.

Included in some areas of this soil are areas of Callahan, Menard, Bonti, Hext, and Winters soils. These included soils make up about 20 percent of any mapped area.

This soil is suitable for cultivation but is mainly used as pastureland because of the hazard of erosion and the low productivity.

Potential for pasture production is medium. Improved grasses such as King Ranch bluestem, kleingrass, weeping lovegrass, and Coastal bermudagrass are well suited to this soil.

Potential for native range plants is medium. The climax plant community is a mixture of tall and mid grasses, forbs, and oak trees. Management needs are proper stocking, controlled grazing, and brush management. Potential for wildlife habitat is high.

Potential for forage sorghum, grain sorghum, and oats is low. Keeping crop residue on the surface helps to conserve moisture, control wind erosion, and maintain tilth. Terraces and contour farming help to control water erosion.

Potential for most urban or recreational uses is medium. Shrinking and swelling of the soil with changes in moisture, the moderately slow permeability, and the clayey subsoil are the main limitations. These limitations can be overcome by good design and careful installation procedures.

This soil is in capability subclass IIIe and the Tight Sandy Loam range site.

61—Real association, hilly. This association consists of shallow soils on uplands. Slopes range from 10 to 30 percent, but average about 15 percent. Most of the areas are 200 to 1,200 feet wide and from one-fourth mile to several miles long.

This association is made up of about 55 percent Real soils and 45 percent other soils. The composition of this map unit is more variable than that of most of the other map units in the survey area; however, the composition has been controlled well enough so that the map unit can be interpreted for the expected uses of the soils.

Typically, Real soils have a surface layer that is friable, moderately alkaline, dark brown very gravelly loam about 11 inches thick. The underlying material to a depth of 24 inches is pinkish gray, weakly cemented limestone interbedded with thin seams of sandy clay loam.

These soils are well drained. Surface runoff is rapid. Permeability is moderate, and available water capacity is very low.

Included in some areas of this association are areas of Doudle, Brackett, and Sunev soils on the lower slopes. Also included are small areas of rock outcrop and Tarrant and Mereta soils on the upper slopes.

Real soils are not suitable for cultivation because of slope, stoniness, shallow rooting depth, and susceptibility to erosion. They are mainly used as rangeland. Potential for native range plants is medium. Rapid runoff, very low available water capacity, and restricted rooting depth limit the amount of forage produced. Management needs are proper stocking and controlled grazing. Potential for wildlife habitat is low.

Potential is low for most urban uses. Slope, the shallow depth to rock, small stones, and high corrosivity to uncoated steel are the main limitations. Potential for recreational uses is low because of steep slopes and small stones.

This association is in capability subclass VIIs and the Steep Adobe range site.

62—Real-Tarrant association, hilly. This association consists of very shallow to shallow soils on uplands. Slopes are 10 to 30 percent. Areas are 200 to about 3,700 feet wide and extend for several miles, mainly in a north-south direction.

Real soils make up about 68 percent of the association, Tarrant soils about 28 percent, and other soils about 4 percent. The composition of this map unit is more variable than that of most of the other map units in the survey area; however, the composition has been controlled well enough so that the map unit can be interpreted for the anticipated use of the areas involved.

The Real soils are shallow. They are mainly on the steep side slopes. Typically, they have a surface layer that is firm, moderately alkaline, very dark grayish brown gravelly clay loam to a depth of about 5 inches and firm, moderately alkaline, dark grayish brown, very gravelly clay loam to a depth of about 11 inches. The underlying material to a depth of 24 inches is weakly cemented limestone interbedded with thin seams of sandy clay loam.

Real soils are well drained. Surface runoff is rapid. Permeability is moderate, and available water capacity is very low.

The Tarrant soils are very shallow to shallow. They are mainly on the sloping ridgetops. Typically, they have a surface layer that is firm, moderately alkaline, very dark grayish brown cobbly clay about 12 inches thick. Below this is platy, fractured limestone. The surface has a 60 percent cover of limestone cobbles and boulders.

Tarrant soils are well drained. Surface runoff is rapid. Permeability is moderately slow, and available water capacity is very slow.

Included in some areas of this association are areas of Brackett, Bolar, and Denton soils. Also included are eroded areas where sheet erosion has removed most of the surface layer. Most areas contain gullies and eroded spots. The upper part of most areas has a vertical face of hard limestone that ranges from 2 to 20 feet high. Boulders, stones, and gravel-size fragments break from this ledge and litter the surface below.

These Real and Tarrant soils are not suitable for cultivation because of slope, stoniness, shallow rooting depth, and susceptibility to erosion. They are mainly used as rangeland, but potential for native range plants is low. Rapid runoff, very low available water capacity, and restricted rooting depth limit the amount of forage produced. Management needs are proper stocking and controlled grazing. Potential for wildlife habitat is low.

These soils have low potential for most urban uses. Slope, shallow depth to limestone bedrock, stones, and high corrosivity to uncoated steel are the main limitations. Potential for recreational uses is low because of steep slopes and stones.

This association is in capability subclass VIIs. Real soils are in the Steep Adobe range site and Tarrant soils are in the Steep Rocky range site.

63—Rochelle fine sandy loam, 1 to 5 percent slopes. This deep, gently sloping soil is on uplands. Slopes are convex and mainly smooth. Areas are irregular in shape and range from 5 to 150 acres.

Typically, the surface layer is friable, neutral, reddish brown fine sandy loam about 8 inches thick. The subsoil extends to a depth of 32 inches. It is friable, neutral, reddish brown sandy clay loam to a depth of 18 inches and firm, moderately alkaline, reddish brown gravelly sandy clay loam below 18 inches. The underlying material to a depth of 60 inches is friable moderately alkaline, strong brown very gravelly sandy loam that contains 60 percent, by volume, rounded limestone and siliceous fragments (fig. 15).

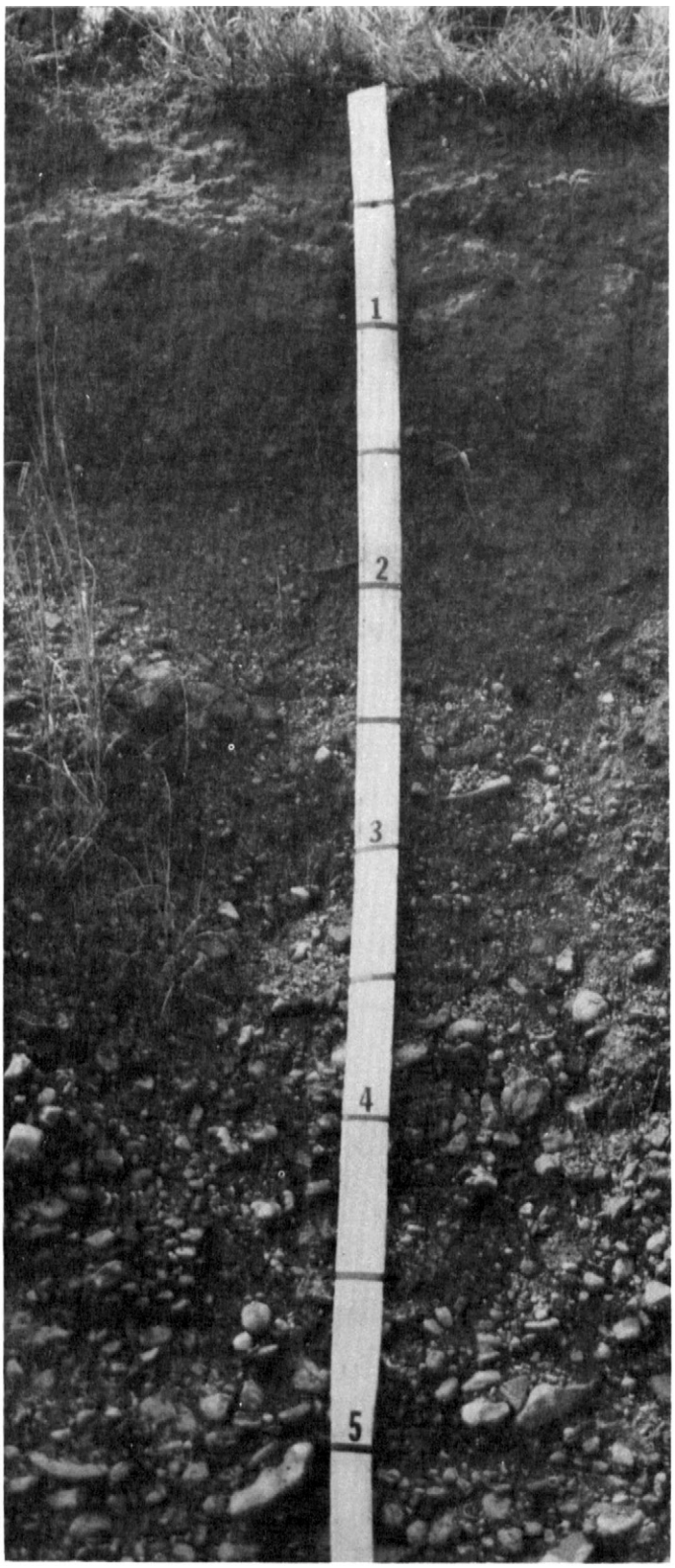


Figure 15.—Profile of Rochelle fine sandy loam, 1 to 5 percent slopes, showing gravelly substratum.

This soil is well drained. Surface runoff is medium. Permeability is moderately slow, and available water capacity is low.

Included in some areas of this soil are areas of Menard, Bastrop, Pedernales, Callahan, and Winters soils. Some areas have a few small gullies. A few areas have slopes of more than 5 percent. Many areas have been mined for the gravel that is within a depth of 6 feet. Included soils make up less than 20 percent of any mapped area.

This soil is suitable for cultivation but is mainly used as rangeland and pastureland. Potential for native range plants is medium. The climax plant community is a mixture of tall and mid grasses, forbs, and oak trees. Management needs are proper stocking, controlled grazing, and brush management. Potential for wildlife habitat is high.

Potential for pasture production is medium. Improved grasses such as kleingrass, weeping lovegrass, and Coastal bermudagrass are suited to this soil.

This soil has low potential for oats, wheat, forage sorghum, and grain sorghum. Keeping crop residue on the surface helps to conserve moisture, control wind erosion, and maintain tilth. Terraces and contour farming help to control water erosion.

Potential for most urban or recreational uses is high. Slope is a limitation for playgrounds.

This soil is in capability subclass IIIe and the Sandy Loam range site.

64—Rowena clay loam, 0 to 1 percent slopes. This deep, nearly level soil is on upland plains and in valleys. Slopes are smooth and slightly concave to plane. Areas are oblong to irregular in shape and range from 10 to 400 acres.

Typically, the surface layer is friable, moderately alkaline, very dark grayish brown clay loam about 12 inches thick. The subsoil extends to a depth of 46 inches. It is firm, moderately alkaline silty clay that is dark grayish brown to a depth of 26 inches, grayish brown to a depth of 36 inches, and brown below 36 inches. The underlying material to a depth of 80 inches is friable, moderately alkaline, yellow silty clay loam.

This soil is well drained. Surface runoff is slow. Permeability is moderately slow, and available water capacity is high.

Included in some areas of this soil are small areas of Sagerton, Nuvalde, Nukrum, Leeray, and Abilene soils. These included soils make up about 20 percent of any mapped area.

This soil is mainly used as cropland or improved pastureland. Small grain and forage sorghums are the main crops, but other crops are grown.

Potential is medium for oats, wheat, grain sorghum, forage sorghum, and cotton. Crop residue left on or near the surface helps to conserve moisture and maintain tilth and productivity.

This soil has medium potential for pasture production. Improved grasses such as kleingrass, Coastal bermuda-

grass, King Ranch bluestem, and weeping lovegrass are suited to this soil.

Potential for native range plants is medium. The climax plant community consists mainly of mid grasses. Management needs are proper stocking, controlled grazing, and brush management. Potential for wildlife habitat is medium.

Potential for most urban uses is low. Shrinking and swelling of the soil with changes in moisture and high corrosivity to uncoated steel are the main limitations. Potential for most recreational uses is medium because of the high content of clay in the surface layer and the moderately slow permeability.

This soil is in capability subclass IIc and the Clay Loam range site.

65—Rowena clay loam, 1 to 3 percent slopes. This deep, gently sloping soil is on upland plains and in valleys. Slopes are smooth and slightly concave to plane. Areas are oblong to irregular in shape and range from 10 to 500 acres.

Typically, the surface layer is firm, moderately alkaline, very dark grayish brown clay loam about 8 inches thick. The subsoil extends to a depth of 42 inches. It is firm, moderately alkaline, dark brown clay loam that has accumulations of calcium carbonate below a depth of 22 inches. The underlying material to a depth of 80 inches is friable, moderately alkaline, pink silty clay loam that contains accumulations of calcium carbonate.

This soil is well drained. Surface runoff is slow. Permeability is moderately slow, and available water capacity is high.

Included in some areas of this soil are areas of Nuvalde, Sagerton, Leeray, and Abilene soils. Included soils make up less than 20 percent of any mapped area.

This soil is mainly used as cropland or improved pastureland. Small grain and forage sorghums are the main crops, but other crops are grown.

Potential is medium for oats, wheat, grain sorghum, forage sorghum, and cotton. Terraces and contour farming help to control erosion. Crop residue left on or near the surface helps to conserve moisture and maintain tilth and productivity.

This soil has medium potential for pasture production. Introduced grasses such as kleingrass, Coastal bermudagrass, King Ranch bluestem, and weeping lovegrass are suited to this soil.

Potential for native range plants is medium. The climax plant community consists mainly of mid grasses. Management needs are proper stocking, controlled grazing, and brush management. Potential for wildlife habitat is medium.

Potential for most urban uses is low. Shrinking and swelling of the soil with changes in moisture and high corrosivity to uncoated steel are the main limitations. Potential for most recreational uses is medium because of the high content of clay in the surface layer and the moderately slow permeability.

This soil is in capability subclass IIe and the Clay Loam range site.

66—Sagerton clay loam, 0 to 1 percent slopes. This deep, nearly level soil is on terraces on upland plains and in valleys. Slopes are smooth and are mainly plane. Areas are oblong to irregular in shape and range from about 10 to 300 acres.

Typically, the surface layer is firm, neutral, dark brown clay loam about 6 inches thick. The subsoil extends to a depth of 80 inches. It is firm, mildly alkaline, reddish brown clay to a depth of 27 inches and firm, moderately alkaline, brown clay that contains accumulations of calcium carbonate to a depth of 39 inches. Below that, it is firm, moderately alkaline, reddish yellow clay loam that contains accumulations of calcium carbonate.

This soil is well drained. Surface runoff is slow. Permeability is moderately slow, and available water capacity is high.

Included in some areas of this soil are small areas of Abilene, Pedernales, Winters, and Rowena soils. Also included are areas of soils that are similar to this Sagerton soil but do not have visible carbonates within a depth of 28 inches. Some areas have a loam surface layer. These included soils make up less than 20 percent of any mapped area.

This soil is mainly used as cropland or improved pastureland. Small grain and forage sorghums are the main crops, but other crops are grown.

Potential for wheat, oats, grain sorghum, cotton, and forage sorghum is high. Crop residue left on the surface helps to conserve moisture and maintain tilth and productivity.

This soil has high potential for pasture production. Introduced grasses such as kleingrass, Coastal bermudagrass, and weeping lovegrass are well suited to this soil.

Potential for native range plants is medium. The climax plant community consists mainly of mid grasses. Management needs are proper stocking, controlled grazing, and brush management. Potential for wildlife habitat is medium.

Potential for most urban or recreational uses is medium. Shrinking and swelling of the soil with changes in moisture, moderate corrosivity to uncoated steel, the high content of clay in the surface layer, and the moderately slow permeability are the main limitations.

This soil is in capability subclass IIc and the Clay Loam range site.

67—Sagerton clay loam, 1 to 3 percent slopes. This deep, gently sloping soil is on terraces on upland plains and in valleys. Slopes are smooth and slightly concave to plane. Areas are oblong to irregular in shape and range from 10 to 200 acres.

Typically, the surface layer is friable, mildly alkaline, dark brown clay loam about 6 inches thick. The subsoil extends to a depth of 80 inches. It is firm, mildly alkaline,

dark brown clay to a depth of about 12 inches and very firm, moderately alkaline, reddish brown clay to a depth of 22 inches. Below this, to a depth of 44 inches, it is very firm, moderately alkaline, brown clay that contains accumulations of calcium carbonate. Next, to a depth of 80 inches, it is firm, moderately alkaline, reddish yellow clay loam that contains about 25 percent, by volume, segregated calcium carbonate.

This soil is well drained. Surface runoff is medium. Permeability is moderately slow, and available water capacity is high.

Included in some areas of this soil are areas of Abilene, Rowena, Winters, and Pedernales soils. Also included are areas of soils that are similar to this Sagerton soil but have a loam surface layer and do not have visible carbonates within a depth of 28 inches. In some areas, the subsoil extends to a depth of 40 to 60 inches. Included soils make up less than 20 percent of any mapped area.

This soil is mainly used as cropland or pastureland. Small grain and forage sorghums are the main crops, but other crops are grown.

Potential is medium for oats, wheat, grain sorghum, forage sorghum, and cotton. Terraces and contour farming help to control erosion. Crop residue left on or near the surface helps to conserve moisture and maintain tilth and productivity.

This soil has high potential for pasture production. Introduced grasses such as kleingrass, Coastal bermudagrass, King Ranch bluestem, and weeping lovegrass are well suited to this soil.

Potential for native range plants is medium. The climax plant community consists mainly of mid grasses. Management needs are proper stocking, controlled grazing, and brush management. Potential for wildlife habitat is medium.

Potential for most urban or recreational uses is medium. Shrinking and swelling of the soil with changes in moisture, moderate corrosivity to uncoated steel, the high content of clay in the surface layer, and the moderately slow permeability are the main limitations.

This soil is in capability subclass IIe and the Clay Loam range site.

68—Sagerton-Urban land complex, 0 to 3 percent slopes. This complex consists of nearly level to gently sloping soils and Urban land on upland terraces, mainly in valleys. Areas are oblong to irregular in shape and range from 40 to 350 acres.

Sagerton soils make up about 45 percent of the complex, Urban land about 40 percent, and other soils about 15 percent. These soils and Urban land are so intricately mixed that it is not practical to map them separately.

Undisturbed areas of Sagerton soils typically have a surface layer that is firm, moderately alkaline, dark grayish brown clay loam about 7 inches thick. The subsoil extends to a depth of 80 inches. It is very firm, moderately alkaline clay. It is dark brown to a depth of 16 inches, brown to a depth of 44 inches, and light brown below 44 inches.

Sagerton soils are well drained. Surface runoff is medium. Permeability is moderately slow, and available water capacity is high.

The Urban land consists mainly of streets, parking areas, houses, and buildings. Part of the Urban land is in the old Camp Bowie area and consists of remnants of abandoned streets and building foundations and spots that have 6 to 10 inches of gravel or caliche material. Much of this area has been altered by grading and shaping.

Included in this complex are intermingled areas of Abilene soils. These areas range from about 20 feet in diameter to 5 acres and are round to irregular in shape.

Potential for most urban uses is medium. Shrinking and swelling of the soil with changes in moisture and moderate corrosivity to uncoated steel are the main limitations, but they can be overcome by proper design and careful installation procedures. The moderately slow permeability of the subsoil limits the use of these soils for septic tank absorption fields. Potential for recreational uses is also medium. The high content of clay in the surface layer and moderately slow permeability are the most restrictive features.

This complex is not placed in a capability subclass or range site.

69—Speck clay loam, 1 to 3 percent slopes. This shallow, gently sloping soil is on uplands, mainly along slightly convex limestone ridges. Slopes are smooth. Areas are irregular in shape and range from 10 to 150 acres.

Typically, the surface layer is firm, moderately alkaline, reddish brown clay loam about 6 inches thick. The subsoil is firm, mildly alkaline, reddish brown clay to a depth of about 18 inches. Below this is strongly cemented, fractured limestone bedrock.

This soil is well drained. Surface runoff is medium. Permeability is slow, and available water capacity is very low.

Included in some areas of this soil are small areas of Lindy soils and small areas of soils that are similar to the Speck soil but are over weakly cemented caliche. These included soils make up less than 20 percent of any mapped area.

This soil can be cultivated but is mainly used as rangeland. Potential for native range plants is medium, mainly because of a restricted root zone. The climax plant community is a mixture of tall, mid, and short grasses with occasional shrubs and live oak motts. Management needs are proper stocking and controlled grazing. Potential for wildlife habitat is medium.

Potential is low for oats, wheat, and grain sorghum. Keeping crop residue on the surface helps to prevent erosion and conserve moisture. It also helps to improve soil tilth and water intake.

Potential for pasture production is low. Improved grasses such as kleingrass, Coastal bermudagrass,

weeping lovegrass, and King Ranch bluestem are suited to this soil.

Potential for most urban uses is low. The shallow depth to bedrock is a limitation that is difficult to overcome. Potential for recreational uses is medium because of the high content of clay in the surface layer, the depth to bedrock, and the slow permeability.

This soil is in capability subclass IIIe and the Redland range site.

70—Speck-Urban land complex, 1 to 3 percent slopes. This complex consists of gently sloping soils and Urban land on uplands, mainly on convex ridges. Areas are irregular in shape and range from 12 to 1,400 acres.

Speck soils make up about 50 percent of the complex, Urban land about 30 percent, and other soils about 20 percent.

Undisturbed areas of Speck soils typically have a surface layer that is firm, neutral, dark brown clay loam about 7 inches thick. The subsoil to a depth of 15 inches is firm, neutral, reddish brown clay. Below that is fractured, pink limestone bedrock.

Speck soils are well drained. Surface runoff is medium. Permeability is slow, and available water capacity is very low.

The Urban land consists mainly of streets, parking areas, houses, and buildings. Part of the Urban land is in the old Camp Bowie area and consists of remnants of abandoned streets and building foundations and spots that have 6 to 10 inches of gravel or caliche material. Much of this area has been altered by grading and shaping. In a few places fills of clayey material are 4 feet or more thick.

Included in this complex are small areas of Lindy, Nukrum, Pedernales, Tarrant, and Rowena soils. In some spots, limestone bedrock is at the surface.

Potential for most urban uses is low. The shallow depth to rock, large stones, shrinking and swelling of the soil with changes in moisture, and high corrosivity to uncoated steel are the main limitations. Depth to rock and the slow permeability of the subsoil limit the use of the soils in this complex for septic tank absorption fields. Potential for recreational uses is also low. Depth to rock, large stones, and slow permeability are the main limitations.

This complex is not placed in a capability subclass or range site.

71—Speck-Tarrant association, gently undulating. This association consists of shallow, stony and cobbly soils on uplands, mainly on plateaus and ridges. Slopes are dominantly 1 to 5 percent. Areas are irregular in shape and range from 20 to several hundred acres.

Speck soils make up about 47 percent of the association, Tarrant soils about 40 percent, and other soils about 13 percent. The composition of this map unit is more variable than that of most of the other map units in the survey area; however, the composition has been controlled well enough so that the map unit can be interpreted for the expected uses of the soils.

Typically, Speck soils have a surface layer that is firm, neutral, brown stony clay loam about 7 inches thick. The subsoil is firm, neutral, reddish brown clay to a depth of about 15 inches. Below this is very pale brown, very hard limestone bedrock.

Speck soils are well drained. Surface runoff is medium. Permeability is slow, and available water capacity is very low.

The Tarrant soils are mainly on small knolls and along the outer edges of the mapped areas. Typically, they have a surface layer that is firm, moderately alkaline cobbly clay about 15 inches thick that is very dark grayish brown in the upper 8 inches and dark grayish brown in the lower 7 inches. Below this is light brownish gray, hard limestone bedrock.

Tarrant soils are well drained. Surface runoff is rapid. Permeability is moderately slow, and available water capacity is very low.

Included in some areas of this association are areas of Mereta, Callahan, Lindy, Throck, and Kavett soils and a soil similar to Speck soils, except it is underlain by limy earth. Also included are a few areas that have slopes of more than 5 percent.

These Speck and Tarrant soils are generally too stony or cobbly for cultivation. The few areas of arable soils are so small and irregularly shaped that cultivation is impractical. These soils are better suited to rangeland (fig. 16).

Potential for native plants is medium. Low available water capacity and restricted rooting depth limit forage production. The climax plant community is a mixture of tall and mid grasses, forbs, and live oak trees. Management needs are proper stocking, controlled grazing, and brush management. Potential for wildlife habitat is medium.

These soils have low potential for most urban and recreational uses. The shallow depth to limestone bedrock, the stony and cobbly surface layer, and high corrosivity to uncoated steel are the main limitations.

Speck soils are in capability subclass VIs and the Redland range site. Tarrant soils are in capability subclass VIIs and the Low Stony Hills range site.

72—Sunev clay loam, 1 to 3 percent slopes. This deep, gently sloping soil is on foot slopes and in shallow valleys of uplands. Slopes are smooth and slightly concave to plane. Areas are long and narrow to irregular in shape and range from 10 to several hundred acres.

Typically, the surface layer is firm, moderately alkaline, dark grayish brown clay loam about 18 inches thick. The subsoil to a depth of 32 inches is friable, moderately alkaline, pale brown clay loam that contains accumulations of calcium carbonate. The underlying material to a depth of 80 inches is friable, moderately alkaline very pale brown and yellow loam that contains accumulations of calcium carbonate.

Figure 16.—Area of Speck-Tarrant association, gently undulating.

This soil is well drained. Surface runoff is medium. Permeability is moderate, and available water capacity is medium.

Included in some areas of this soil are areas of Rowena, Krum, and Frio soils. These included soils make up less than 20 percent of any mapped area.

This soil is mainly used as cropland or improved pastureland. Small grain and forage sorghum are the main crops, but other crops are grown.

Potential for wheat, oats, grain sorghum, forage sorghum, and cotton is high. Terraces and contour farming help to control erosion. Crop residue left on or near the surface helps to conserve moisture and maintain tilth and productivity.

This soil has high potential for pasture production. Improved grasses such as kleingrass, Coastal bermudagrass, King Ranch bluestem, and weeping lovegrass are suited to this soil.

Potential for native range plants is high. The climax plant community consists mainly of tall and mid grasses. Management needs are proper stocking, controlled grazing, and brush management. Potential for wildlife habitat is also high.

Potential for most urban and recreational uses is high. The high content of clay in the surface layer is a limitation for most uses.

This soil is in capability subclass IIe and the Clay Loam range site.

73—Tarpley clay loam, 1 to 3 percent slopes. This shallow, gently sloping soil is on uplands, mainly along slightly convex limestone ridges. Slopes are smooth. Areas are irregular in shape and range from 10 to 150 acres.

Typically, the surface layer is firm, neutral, dark brown clay loam about 4 inches thick. The subsoil is very firm, neutral, reddish brown clay to a depth of about 19 inches. Below this is strongly cemented, fractured limestone.

This soil is well drained. Surface runoff is medium. Permeability is slow, and available water capacity is very low.

Included in some areas of this soil are small areas of Mereta, Bolar, and Caradan soils. Also included is a soil that is similar to this Tarpley soil but is more than 20 inches deep over hard limestone. Included soils make up about 20 percent of any mapped area.

The Tarpley soil can be cultivated but is mainly used as rangeland. Potential for native range plants is medium, mainly because of the restricted root zone. The climax plant community is a mixture of tall, mid, and short grasses with occasional shrubs and live oak motts. Management needs are proper stocking and controlled grazing. Potential for wildlife habitat is medium.

Potential for small grain and grain sorghum is medium. Keeping crop residue on the surface helps to prevent erosion and conserve moisture. It also helps to improve soil tilth and water intake.

Potential for pasture production is low. Improved grasses such as kleingrass, Coastal bermudagrass, weeping lovegrass, and King Ranch bluestem are suited to this soil.

Potential for most urban and recreational uses is low. The shallow depth to bedrock is a limitation that is difficult to overcome.

This soil is in capability subclass IIIe and the Redland range site.

74—Tarpley-Tarrant association, gently undulating. This association consists of stony and cobbly, very shallow and shallow soils on uplands, mainly on plateaus and ridges. Slopes range from 1 to 5 percent. Areas are irregular in shape and range from 20 to several thousand acres.

Tarpley soils make up about 36 percent of the association, Tarrant soils about 20 percent, and other soils about 44 percent. The composition of this map unit is more variable than that of most of the other map units in the survey area; however, the composition has been controlled well enough so that the map unit can be interpreted for the expected uses of the soils.

The Tarpley soils are shallow. Typically, they have a surface layer that is firm, neutral, very dark grayish brown stony clay loam about 7 inches thick. The subsoil is very firm, neutral, reddish brown clay to a depth of about 18 inches. Below this is pale yellow, hard limestone bedrock.

Tarpley soils are well drained. Surface runoff is medium. Permeability is slow, and available water capacity is very low.

The Tarrant soils are very shallow to shallow. Typically, they have a surface layer that is firm, moderately alkaline cobbly clay about 16 inches thick that is very dark grayish brown in the upper 6 inches and dark brown in the lower 10 inches. Below this is hard limestone.

Tarrant soils are well drained. Surface runoff is rapid. Permeability is moderately slow, and available water capacity is very low.

Included in some areas of this association are areas of Mereta, Caradan, Real, Brackett, and Denton soils and a soil similar to Tarpley soils, except it is underlain by limy earth. Also included are a few sloping to strongly sloping areas.

These Tarpley and Tarrant soils are generally too stony for cultivation. The few areas of arable soils are so small and irregularly shaped that cultivation is impractical. These soils are better suited to rangeland.

Potential for native plants is medium. Low available water capacity and the restricted rooting depth limit forage production. The climax plant community is a mixture of tall and mid grasses, forbs, and live oak trees. Management needs are proper stocking, controlled grazing, and brush management. Potential for wildlife habitat is medium.

Potential for most urban or recreational uses is low. The shallow to very shallow depth to bedrock and stoniness are the main limitations.

Tarpley soils are in capability subclass VIs and the Redland range site. Tarrant soils are in capability subclass VIIs and the Low Stony Hills range site.

75—Tarrant-Tarpley association, undulating. This association consists of cobbly and stony, very shallow and shallow soils on uplands. The landscape is a series of rounded hilltops and ridges. Slopes range from 1 to 8 percent. Areas are irregular in shape and range from 20 to several thousand acres.

Tarrant soils make up about 46 percent of the association, Tarpley soils about 15 percent, and other soils about 39 percent. The composition of this map unit is more variable than that of most of the other map units in the survey area; however, the composition has been controlled well enough so that the map unit can be interpreted for the expected uses of the soils.

Tarrant soils are very shallow to shallow. They are mainly on the upper parts of slopes and side slopes. Typically, the surface layer is about 8 inches thick. It is firm, moderately alkaline, very dark grayish brown cobbly clay in the upper 4 inches and firm, moderately alkaline, dark grayish brown very cobbly clay in the lower 4 inches. Below that is light gray, fractured limestone.

Tarrant soils are well drained. Surface runoff is rapid. Permeability is moderately slow, and available water capacity is very low.

The gently sloping Tarpley soils are shallow. They are mainly on the ridgetops. Typically, the surface layer is firm, moderately alkaline, dark brown stony clay loam about 5 inches thick. The subsoil extends to a depth of 18 inches. It is very firm, moderately alkaline, reddish brown clay that contains a few limestone fragments in the lower part. Below that is hard limestone.

Tarpley soils are well drained. Surface runoff is medium. Permeability is slow, and available water capacity is very low.

Included in this association are areas of Brackett, Bolar, Mereta, Caradan, and Sunev soils. Also included are areas that have slopes of more than 8 percent.

These Tarrant and Tarpley soils are generally too stony or cobbly or too steep for cultivation. The few areas of arable soils are so small and irregularly shaped that cultivation is impractical. These soils are best suited for rangeland.

Potential for native plants is medium. Low available water capacity and restricted rooting depth limit forage production. The climax plant community is a mixture of tall and mid grasses, forbs, and live oak trees. Management needs are proper stocking, controlled grazing, and brush management. Potential for wildlife habitat is medium.

These soils have low potential for most urban and recreational uses. The very shallow to shallow depth to limestone bedrock, stoniness, and high corrosivity to uncoated steel are the main limitations.

Tarrant soils are in capability subclass VIIs and the Low Stony Hills range site. Tarpley soils are in capability subclass VIs and the Redland range site.

76—Throck association, hilly. This association consists of deep, stony soils on uplands. Slopes range from 10 to more than 30 percent but average about 14 percent. Areas are long and narrow to irregular in shape and range from 20 to several hundred acres (fig. 17).

Throck soils and soils that are closely similar, but are less than 20 inches to shaly clay, make up about 77 percent of this association. Other soils make up about 23 percent. The composition of this map unit is more variable than that of most of the other map units in the survey area; however, the composition has been controlled well enough so that the map unit can be interpreted for the expected uses of the soils.

Typically, Throck soils have a surface layer that is firm, moderately alkaline, grayish brown stony clay loam about 8 inches thick. The subsoil is firm, moderately alkaline, light yellowish brown clay to a depth of about 32 inches. The underlying material to a depth of 60 inches is light yellowish brown shaly clay.

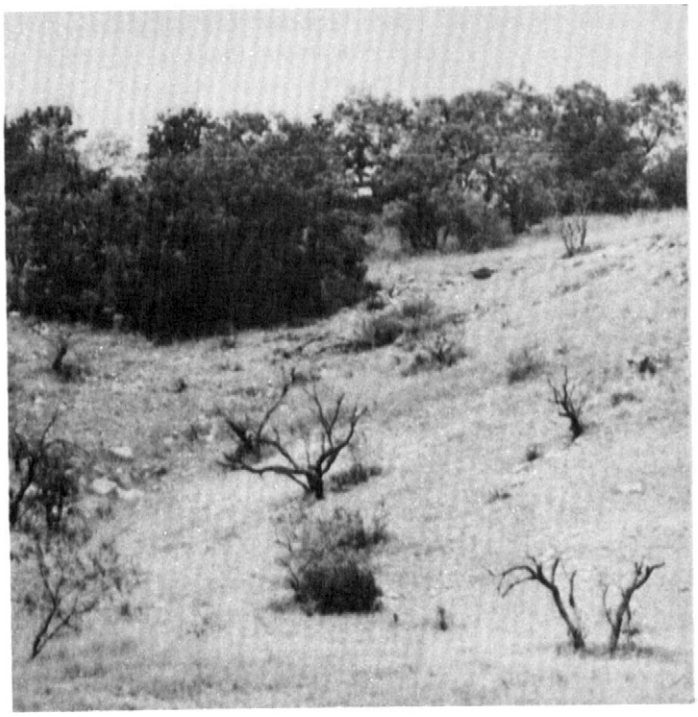


Figure 17.—Area of Throck association, hilly.

These soils are well drained. Surface runoff is rapid. Permeability is slow, and available water capacity is medium.

Included with these soils are small areas of Tarrant, Speck, and Bonti soils, which are mainly on ridgetops. Also included are small areas of Callahan and Nukrum soils, which are on lower parts of slopes. Some areas have steep to very steep slopes.

Throck soils are not suitable for cultivation because of steep slopes, stones, and susceptibility to erosion. These soils are mainly used as rangeland.

Potential for native plants is medium. Rapid runoff and a restricted rooting depth limit forage production. The climax plant community is a mixture of mid and short grasses, forbs, and shrubs. Management needs are proper stocking, controlled grazing, and brush management. Potential for wildlife habitat is medium.

These soils have low potential for most urban or recreational uses. Steep slopes, shrinking and swelling of the soil with changes in moisture, and the stony surface layer are the main limitations.

This association is in capability subclass VIIs and the Rocky Hills range site.

77—Weswood silt loam, occasionally flooded. This deep, nearly level soil is on flood plains. Slopes are weakly concave to convex and range from 0 to 1 percent. Most areas of this soil are subject to flooding about once in 10 to 20 years. Areas are long and narrow and range from 10 to several hundred acres.

Typically, the surface layer is friable, moderately alkaline, reddish brown silt loam about 8 inches thick. The subsoil to a depth of 42 inches is friable, moderately alkaline, reddish brown silt loam. The underlying material to a depth of 80 inches is friable, moderately alkaline, reddish yellow silt loan with thin strata of silty clay loam and fine sandy loam.

This soil is well drained. Surface runoff is slow. Permeability is moderate, and available water capacity is high.

Included in some areas of this soil are small areas of Clairemont and Miller soils. Also included are small areas of a soil that is similar to this Weswood soil but has a higher content of sand. Narrow benches separating different levels of the flood plains which have slopes of more than 1 percent are also included. Included soils make up about 15 percent of any mapped area.

This soil is mainly used as cropland and pastureland. Small grain and grain sorghum are the main cultivated crops. Pecans are well suited to this soil.

Potential for wheat, oats, forage sorghum, and grain sorghum is high. Crop residue left on the surface helps to conserve moisture and maintain tilth and productivity.

Potential for pasture production is high. Pasture grasses such as kleingrass, Coastal bermudagrass, and johnsongrass are well suited to this soil.

Potential for native range plants is high. The climax plant community is a mixture of tall and mid grasses, forbs, and scattered shrubs and trees. Management needs are proper stocking, controlled grazing, and brush management. Potential for wildlife habitat is also high.

This soil has low potential for most urban uses. Flooding is a limitation that is very difficult to overcome. Potential for most recreational uses is medium. Flooding restricts the use of this soil for campsites.

This soil is in capability subclass IIw and the Loamy Bottomland range site.

78—Winters fine sandy loam, 0 to 1 percent slopes. This deep, nearly level soil is on upland plains and in valleys. Slopes are smooth and slightly convex to plane. Areas are broad to irregular in shape and range from 10 to 300 acres.

Typically, the surface layer is friable, neutral, reddish brown fine sandy loam about 9 inches thick. The subsoil extends to a depth of 67 inches. It is firm, mildly alkaline, reddish brown clay loam to a depth of 38 inches and firm, moderately alkaline, yellowish red clay loam to a depth of about 45 inches. Below that, it is firm, light reddish brown clay loam that has accumulations of calcium carbonate. The underlying material to a depth of 80 inches is moderately alkaline, pink sandy clay loam.

This soil is well drained. Surface runoff is medium. Permeability is moderately slow, and available water capacity is high.

Included in some areas of this soil are small areas of Sagerton, Abilene, Bastrop, Pedernales, and Rowena soils. Also included are small areas of a soil that is similar to this Winters soil, except it has a clay loam surface layer. These included soils make up less than 15 percent of any mapped area.

This soil is mainly used as cropland or improved pastureland. Small grain and forage sorghums are the main crops, but other crops are grown.

Potential is high for wheat, oats, grain sorghum, and forage sorghum and medium for peanuts. Crop residue left on or near the surface helps to conserve moisture and maintain tilth and productivity.

This soil has high potential for pasture production. Introduced grasses such as kleingrass, Coastal bermudagrass, and weeping lovegrass are well suited to this soil.

Potential for native range plants is medium. The climax plant community is a mixture of tall and mid grasses, forbs, and scattered oak trees. Management needs are proper stocking, controlled grazing, and brush management. Potential for wildlife habitat is high.

Potential for most urban uses is medium. Shrinking and swelling of the soil with changes in moisture, high corrosivity to uncoated steel, and the high content of clay in the subsoil are the main limitations. Potential for recreational uses is high.

This soil is in capability subclass IIe and the Sandy Loam range site.

79—Winters fine sandy loam, 1 to 3 percent slopes. This deep, gently sloping soil is on uplands and in valleys. Slopes are smooth and slightly convex to plane. Areas are oblong to irregular in shape and range from 10 to several hundred acres.

Typically, the surface layer is friable, neutral, reddish brown fine sandy loam about 6 inches thick. The subsoil extends to a depth of 65 inches. It is firm, neutral, reddish brown clay loam to a depth of 10 inches and firm, moderately alkaline, reddish brown clay to a depth of 36 inches. Below that, it is firm, moderately alkaline, yellowish red and reddish yellow clay loam to a depth of 65 inches. The subsoil contains accumulations of calcium carbonate below a depth of 48 inches. The underlying material to a depth of 80 inches is friable, moderately alkaline, yellowish red clay loam.

This soil is well drained. Surface runoff is medium. Permeability is moderately slow, and available water capacity is high.

Included in some areas of this soil are areas of Abilene, Bastrop, Pedernales, Rowena, Callahan, and Sagerton soils. Also included in some areas are soils similar to this Winters soil, but the surface layer is loam. Included soils make up less than 15 percent of any mapped area.

This soil is mainly used as cropland or pastureland. Small grain and forage sorghums are the main crops, but other crops are grown.

Potential is high for oats, grain sorghum, and forage sorghum and medium for wheat and peanuts. Crop residue left on or near the surface helps to conserve moisture and maintain tilth and productivity. Terraces and contour farming are used to help control erosion.

This soil has medium potential for pasture production. Introduced grasses such as kleingrass, Coastal bermudagrass, King Ranch bluestem, and weeping lovegrass are well suited to this soil.

Potential for native range plants is medium. The climax plant community is a mixture of tall and mid grasses, forbs, and oak trees. Management needs are proper stocking, controlled grazing, and brush management. Potential for wildlife habitat is high.

Potential for most urban uses is medium. Shrinking and swelling of the soil with changes in moisture, high corrosivity to uncoated steel, and high content of clay in the subsoil are the main limitations. These limitations can be easily overcome by proper design and careful installation procedures. Potential for recreational uses is high.

This soil is in capability subclass IIe and the Sandy Loam range site.

80—Winters fine sandy loam, 2 to 5 percent slopes, eroded. This gently sloping soil is on uplands. Slopes are smooth and slightly convex. Sheet erosion has removed 25 to 75 percent of the original surface layer, and shallow gullies with sloping sides are at intervals of 50 to 200 feet in most areas. Areas are irregular in shape and range from about 10 to 200 acres.

Typically, the surface layer is friable, moderately alkaline, brown fine sandy loam about 6 inches thick. The subsoil is firm, moderately alkaline clay loam to a depth of 68 inches. It is dark reddish brown to a depth of 14 inches, reddish brown to a depth of 38 inches, and reddish yellow below 38 inches (fig. 18).

This soil is well drained. Surface runoff is medium. Permeability is moderately slow, and available water capacity is high.

Included in some areas of this soil are areas of Callahan, Menard, Bonti, and Pedernales soils. These included soils make up less than 20 percent of any mapped area.

This Winters soil is suitable for cultivation but is mainly used as pastureland because of erosion problems and low productivity. Potential for pasture production is medium. Improved grasses such as King Ranch bluestem, kleingrass, weeping lovegrass, and Coastal bermudagrass are suited to this soil.

Potential for native range plants is medium. The climax plant community is a mixture of tall and mid grasses, forbs, and oak trees. Management needs are proper

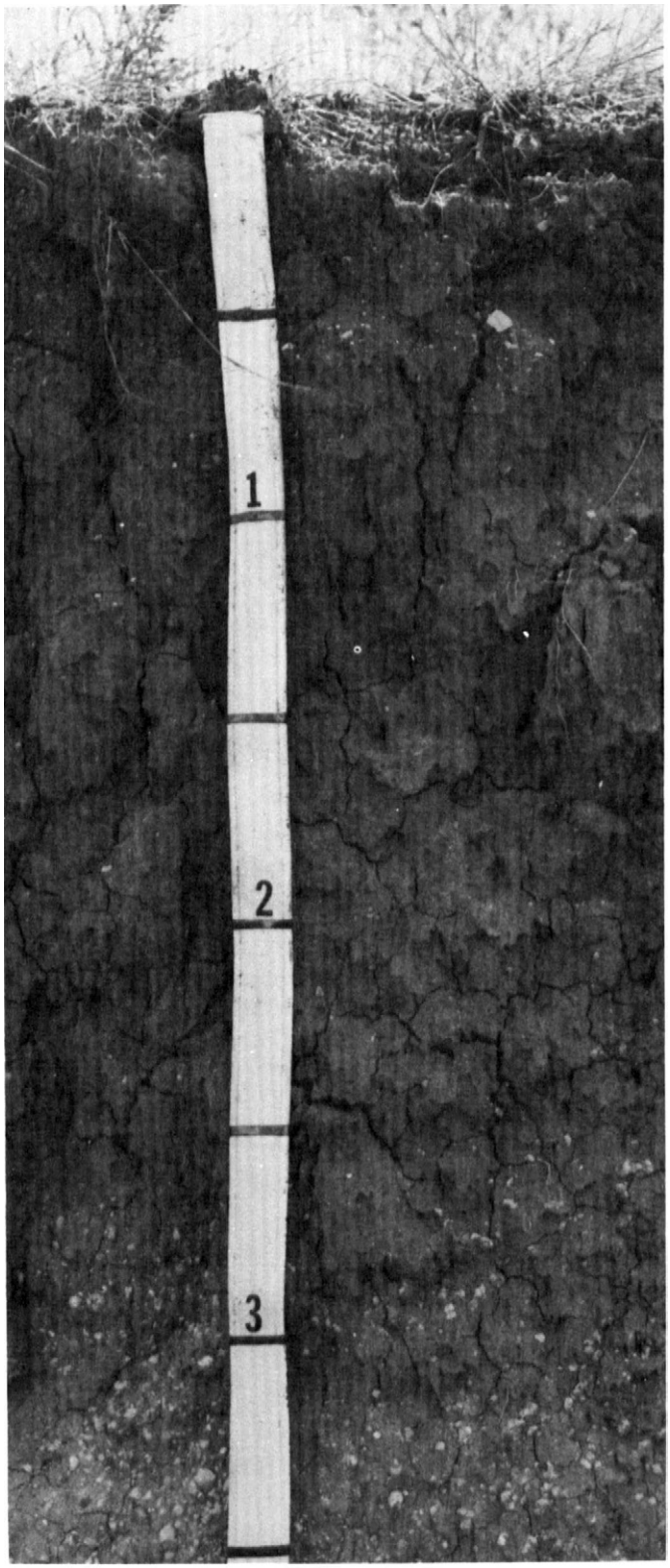


Figure 18.—Profile of Winters fine sandy loam, 2 to 5 percent slopes, eroded.

stocking, controlled grazing, and brush management. Potential for wildlife habitat is high.

Potential for forage sorghum, grain sorghum, and oats is medium. Keeping crop residue on the surface helps to conserve moisture, control wind erosion, and maintain tilth. Terraces and contour farming help to control water erosion.

Potential for most urban or recreational uses is medium. Shrinking and swelling of the soil with changes in moisture, high corrosivity to uncoated steel, the high content of clay in the subsoil, and moderately slow permeability are the main limitations. These limitations can be overcome by proper design and careful installation procedures.

This soil is in capability subclass IIIe and the Sandy Loam range site.

81—Winters-Urban land complex, 1 to 3 percent slopes. This complex consists of gently sloping soils and Urban land on uplands. Areas are oblong to irregular in shape and range from 25 to 250 acres.

Winters soils make up about 40 percent of the complex, Urban land about 40 percent, and other soils about 20 percent. These soils and Urban land are so intricately mixed that it is not practical to map them separately.

Undisturbed areas of Winters soils typically have a surface layer that is friable, moderately alkaline, brown fine sandy loam about 8 inches thick. The subsoil to a depth of 38 inches is very firm, mildly alkaline, reddish brown clay. Below that to a depth of 62 inches, it is firm, moderately alkaline, light reddish brown silty clay that contains accumulations of calcium carbonate.

Winters soils are well drained. Surface runoff is medium. Permeability is moderately slow, and available water capacity is high.

The Urban land consists mainly of streets, parking areas, houses, railroads, and buildings. Part of the Urban land is in the old Camp Bowie area and consists of remnants of abandoned streets and building foundations and spots that have 6 to 10 inches of gravel or caliche material. Much of this area has been altered by grading and shaping.

Included in this complex are small areas of Callahan, Pedernales, and Sagerton soils.

Potential for most urban uses is medium. Shrinking and swelling of the soil with changes in moisture and high corrosivity to uncoated steel are the main limitations, but they can be overcome by proper design and careful installation procedures. The moderately slow permeability limits the use of the soils in this complex for septic tank absorption fields. Potential for recreational uses is high. The moderately slow permeability is a limitation for playgrounds and camp areas.

This complex is not placed in a capability subclass or range site.

Use and management of the soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Crops and pasture

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Soil maps for detailed planning." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

More than 223,950 acres in the survey area was used for crops and pasture in 1967, according to the Conservation Needs Inventory (*4*). Of this total, 19,989 acres in Brown County and 6,946 acres in Mills County was used

for permanent pasture; 25,665 acres in Brown County and 12,008 acres in Mills County for row crops; 89,321 acres in Brown County and 47,135 acres in Mills County for close-growing crops, mainly wheat and oats; 3,156 acres in Brown County and 1,302 acres in Mills County for rotation hay and pasture; and 2,190 acres in Brown County and 1,555 acres in Mills County for orchards, mainly pecans. The rest was idle cropland.

The soils in the survey area have good potential for increased production of food. Several thousand acres of potentially good cropland is currently used as rangeland and pastureland. In addition to the reserve productive capacity represented by this land, food production could also be increased considerably by extending the latest crop production technology to all cropland in the survey area. This soil survey can help facilitate the application of such technology.

Soil erosion is the major concern on nearly all of the cropland in the survey area where slope is more than 2 percent. Erosion is a hazard on the Bolar, Callahan, Chaney, Menard, and Pedernales soils, for example, which have slopes of 2 to 5 percent.

Loss of the surface layer through erosion is damaging for two reasons. First, productivity is reduced as the surface layer is lost and part of the subsoil is incorporated into the plow layer. Loss of the surface layer is especially damaging on soils that have a clayey subsoil, such as the Callahan, Chaney, Pedernales, and Winters soils, and on soils that have bedrock below the subsoil that limits the depth of the root zone. Shallow and moderately deep soils that are underlain by bedrock include the Bolar, Bonti, Kavett, Lindy, and Speck soils. Erosion also reduces productivity on soils that tend to be droughty, such as Callahan loam. Second, soil erosion on farmland results in sedimentation of streams. Control of erosion minimizes the pollution of streams by sediment and improves the quality of water for municipal use, for recreation, and for fish and wildlife.

Erosion control practices provide protective surface cover, reduce runoff, and increase infiltration. A cropping system that keeps vegetative cover on the soil for extended periods can hold soil erosion losses to amounts that will not reduce the productive capacity of the soils. On livestock farms, which require pasture and hay, the legume and grass forage crops in the cropping system reduce erosion on sloping land, provide nitrogen, and improve tilth for the following crop.

Minimizing tillage and leaving crop residue on the surface help increase infiltration and reduce the hazards of runoff and erosion. Keeping residue on the surface also reduces crusting, reduces packing by rain and farm machinery, reduces evaporation of soil moisture, and adds organic matter to the soil. In addition, it shades the soil and reduces soil temperature. Minimum tillage for grain sorghum, which is becoming increasingly common, is effective in reducing erosion on sloping land and can be adapted to most soils in the survey area.

Terraces and diversions reduce the length of slope and reduce runoff and erosion. They are most practical on deep, well drained soils that have regular slopes.

Wind erosion is a hazard on the sandy Cisco, Desan, Nimrod, and Patilo soils. Wind erosion can damage these soils in a few hours if winds are strong and the soils are dry and bare of vegetation or surface mulch. Maintaining vegetative cover, surface mulch, or rough surfaces through proper tillage minimizes wind erosion on these soils. Most crops provide adequate cover during the growing season, but do not leave enough residue for soil protection. Crops such as peanuts need to be followed by a cover crop such as rye or vetch.

Information for the design of erosion control practices for each kind of soil is available in local offices of the Soil Conservation Service.

Soil fertility is naturally low to medium in most soils on uplands in the survey area. Nitrogen and phosphorus are the most deficient nutrients. A few sandy soils are also deficient in potassium. The soils on flood plains, such as Bosque, Deleon, and Frio soils, are naturally higher in plant nutrients than most upland soils.

Soil tilth is an important factor in the germination of seeds and in the infiltration of water into the soil. Soils that have good tilth are granular and porous.

Many of the soils used for crops in the survey area have a surface layer of fine sandy loam or loam that is light in color and low in content of organic matter. Generally the structure of such soils is weak, and intense rainfall causes the formation of a crust on the surface. The crust is hard when dry and nearly impervious to water. Once the crust forms, it reduces infiltration and increases runoff. Regular additions of crop residue, manure, and other organic material can help improve soil structure and reduce crust formation.

The dark colored Deleon and Leeray soils are clayey, and tilth is a concern because the soils commonly stay wet until late in spring. If they are wet when plowed, they tend to be very cloddy when dry and good seedbeds are difficult to prepare. Fall plowing on such wet soils generally results in good tilth in the spring.

Field crops suited to the soils and climate of the survey area include many that are not now commonly grown. Grain sorghum and peanuts are the principal row crops. Cotton, corn, sunflowers, guar, soybeans, castor beans, and similar crops can be grown if economic conditions are favorable (fig. 19).

Wheat, forage sorghum, and oats are the common close-growing crops. Rye, barley, vetch, alfalfa, and millet are also grown; and grass seed could be produced from kleingrass, King Ranch bluestem, and weeping lovegrass (fig. 20).

Special crops grown commercially in the survey area are vegetables, small fruits, tree fruits, and nursery plants. A small acreage throughout the survey area is used for watermelons, cantaloupes, sweet potatoes, sweet corn, tomatoes, peppers, and other vegetables and small fruits. In addition, other areas are adapted to other special crops such as blackberries, grapes, and

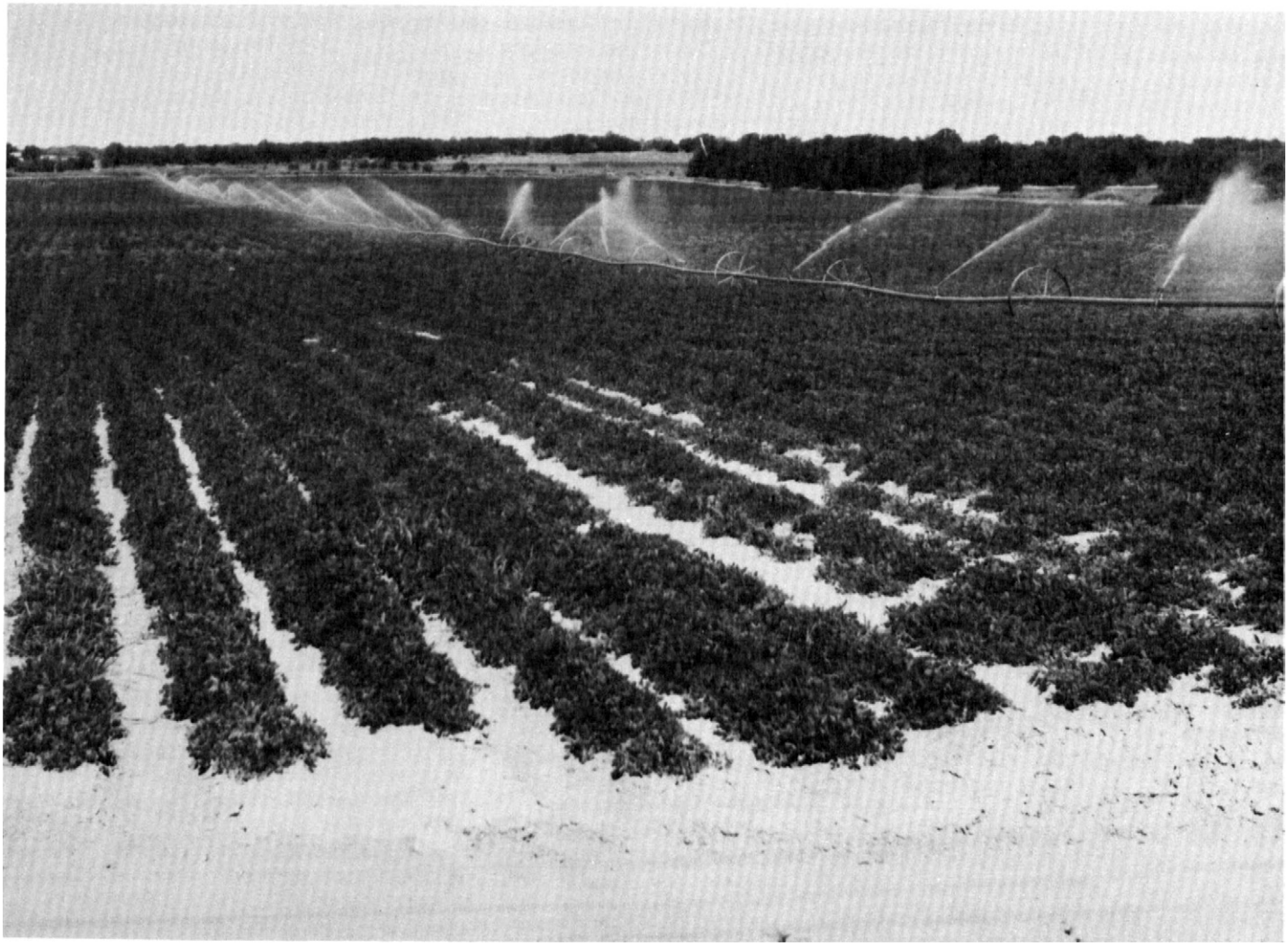


Figure 19.—Irrigated peanuts in a field of Pedernales fine sandy loam, 1 to 3 percent slopes.

many vegetables. Apples, pecans, and peaches are the most important tree fruits grown in the survey area.

Deep soils that have good natural drainage and that warm up early in spring are especially well suited to many vegetables and small fruits. In the survey area these are the Bastrop, Cisco, Chaney, May, Menard, Pedernales, Sagerton, and Winters soils that have slopes of less than 5 percent. Timely irrigation commonly doubles the yield of most horticultural crops. Sprinkler irrigation works satisfactorily on gently sloping areas and is generally the only type suitable for the more sandy soils. Soils in low positions where frost is frequent and air drainage is poor, however, generally are poorly suited to early vegetables, small fruits, and orchards.

Latest information and suggestions for growing special crops can be obtained from local offices of the Cooperative Extension Service and the Soil Conservation Service.

Pasture is important in the survey area because raising livestock is the main farm enterprise. For the past several years, the trend has been to convert land from other uses to pasture and hay. Land used for pasture and hay generally is planted to introduced grasses that respond to good management. These grasses are mainly used to provide year-round grazing in combination with native range and supplemental pasture.

Among the important grasses are Coastal bermudagrass, kleingrass, weeping lovegrass, johnsongrass, indiangrass, switchgrass, King Ranch bluestem, and caucasian bluestem. Improved grasses such as Coastal ber-

Figure 20.—Weeping lovegrass pasture on Chaney loamy fine sand, 1 to 5 percent slopes.

mudagrass and kleingrass are better suited to deep soils on bottom lands, such as Bosque, Energy, and Frio soils. These two grasses, however, are suited to most of the soils. Weeping lovegrass is widely suited to the soils in this survey area and provides good yields of forage on loamy and sandy, upland soils, such as Bonti, Chaney, Cisco, Desan, Nimrod, and Patilo soils. King Ranch bluestem and caucasian bluestem are drought resistant grasses that are well suited to soils such as Callahan loam and Speck clay loam.

Good management practices for pasture are fertilization, maintenance of proper grazing heights of forage, rotation grazing, weed and brush management, and maintaining an adequate livestock water supply. Good management practices for hay are fertilization and cutting the forage at the proper height and at the proper stage of growth.

Yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 6. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green-manure crops; and harvesting that insures the smallest possible loss.

For yields of irrigated crops, it is assumed that the irrigation system is adapted to the soils and to the crops grown, that good quality irrigation water is uniformly applied as needed, and that tillage is kept to a minimum.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 6 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils.

Land capability classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor does it consider possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. Only class and subclass are used in this survey. These levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have slight limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production. This survey area has no class VIII soils.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, wildlife habitat, or recreation.

Capability units are soil groups within a subclass. The soils in a capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-4 or IIIe-6.

The acreage of soils in each capability class and subclass is shown in table 7. The capability classification of each map unit is given in the section "Soil maps for detailed planning."

Rangeland

About 78 percent of Brown County, or 477,150 acres, is native rangeland. Mills County has about 81 percent, or 384,453 acres, in rangeland. More than 80 percent of the agricultural income of Brown County and 90 percent of Mills County is derived from livestock, mainly cattle. The main source of forage for the livestock is rangeland. Income derived from wildlife and other recreational enterprises on rangeland is becoming increasingly important.

Most ranches are cow-calf operations, though stocker steers make up a significant percentage of many herds. Several ranches specialize in breeding and selling purebreds and crossbreeds.

On many ranches the forage produced on rangeland is supplemented by tame pasture, crop stubble, and small

grain. In winter the native forage is often supplemented with protein concentrate. Creep feeding of calves and yearlings to increase market weight is practiced on some ranches.

The native vegetation in many parts of the survey area has been greatly depleted by continued excessive use. Much of the acreage that was once open grassland is now covered with mesquite brush, weeds, and cactus. The amount of forage produced may be less than half of that originally produced. Productivity of the range can be increased by using management practices that are effective for specific kinds of soil and range sites.

In areas that have similar climate and topography, differences in the kind and amount of vegetation produced on rangeland are closely related to the kind of soil. Effective management is based on the relationship between the soils and vegetation and water.

Table 8 shows, for each soil in the survey area, the range site; the total annual production of vegetation in favorable, normal, and unfavorable years; the characteristic vegetation; and the average percentage of each species. Only those soils that are used as or are suited to rangeland are listed. Explanation of the column headings in table 8 follows.

A *range site* is a distinctive kind of rangeland that produces a characteristic natural plant community that differs from natural plant communities on other range sites in kind, amount, and proportion of range plants. The relationship between soils and vegetation was established during this survey; thus, range sites generally can be determined directly from the soil map. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the productivity of range plants. Soil reaction, salt content, and a seasonal high water table are also important.

Potential production is the amount of vegetation that can be expected to grow annually on well managed rangeland that is supporting the potential natural plant community. It includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year's growth of leaves, twigs, and fruits of woody plants. It does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation for favorable, normal, and unfavorable years. In a favorable year, the amount and distribution of precipitation and the temperatures make growing conditions substantially better than average. In a normal year, growing conditions are about average. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture.

Dry weight is the total annual yield per acre reduced to a common percent of air-dry moisture.

Common plant name is given for grasses, forbs, and shrubs that make up most of the potential natural plant community on each soil. Under *composition*, the expected percentage of the total annual production is given for each species making up the characteristic vegetation. The amount that can be used as forage depends on the kinds of grazing animals and on the grazing season.

Range management requires a knowledge of the kinds of soil and of the potential natural plant community. It also requires an evaluation of the present range condition. Range condition is determined by comparing the present plant community with the potential natural plant community on a particular range site. The more closely the existing community resembles the potential community, the better the range condition. Range condition is an ecological rating only. It does not have a specific meaning that pertains to the present plant community in a given use.

The objective in range management is to control grazing so that the plants growing on a site are about the same in kind and amount as the potential natural plant community for that site. Such management generally results in the optimum production of vegetation, conservation of water, and control of erosion. Sometimes, however, a range condition somewhat below the potential meets grazing needs, provides wildlife habitat, and protects soil and water resources.

In the western and southwestern parts of Brown County and in an area around and north of Brownwood, rangeland generally consists of open grassland prairie. The soils are loamy or clayey and have a deep or moderately deep, clay loam or clay subsoil. These soils support mid grasses, and potential productivity is medium.

In much of the central part of Brown County, from Lake Brownwood south to the Colorado River, the rangeland generally consists of shallow or moderately deep, loamy open prairies over limestone. The soils support live oak trees and tall and mid grasses, such as little bluestem and sideoats grama. The productivity is low to medium.

In the central part of Brown County, north and south of May and in an area around Bangs, the rangeland generally consists of oak savannah rangeland, commonly called West Cross Timbers. The soils are loamy or sandy and have a deep, sandy clay or sandy clay loam subsoil. These soils support post oak and blackjack oak trees and tall grasses, such as little bluestem and indiangrass. The potential productivity is high.

The major part of Mills County consists of gently sloping to sloping open prairie with loamy or clayey soils over limestone. These soils support live oak and shin oak trees and tall grasses, such as little bluestem, big bluestem, and indiangrass. Productivity is high.

The major management concern on most of the rangland is controlling grazing so that the kinds and amounts of plants that make up the potential plant community are reestablished. Controlling brush and minimizing soil erosion are also important management concerns. If sound range management is applied, based on soil survey information and rangeland inventories, the potential is good for increasing the productivity of range in the area.

Engineering

Robert W. Rothe, engineer, Soil Conservation Service, helped prepare this section.

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building site development

Table 9 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of

gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential and depth to a high water table affect the traffic supporting capacity.

Sanitary facilities

Table 10 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 10 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to effectively filter the effluent. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 10 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 10 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are

free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction materials

Table 11 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a probable or improbable source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 11, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water management

Table 12 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Recreation

The soils of the survey area are rated in table 13 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 13, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design,

or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 13 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 10 and interpretations for dwellings without basements and for local roads and streets in table 9.

Camp areas require site preparation such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking, horseback riding, and bicycling should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Wildlife habitat

Wildlife resources are important sources of recreation and income in the survey area. The main kinds of wildlife are deer, turkey, quail, dove, squirrel, and rabbit. Important furbearers are raccoon, fox, bobcat, skunk, and opossum. Ducks and geese are attracted to lakes and ponds during migration. Most farm ponds and flood prevention lakes are stocked with channel catfish, black bass, and sunfish.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 14, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be established, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are grain sorghum, wheat, oats, and sunflowers.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are johnsongrass, lovegrass, kleingrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, vine mesquite, sunflowers, and wildbean.

Shrubs are bushy woody plants that produce fruit, buds, twigs, bark, and foliage. Soil properties and fea-

tures that affect the growth of shrubs are depth of the root zone, available water capacity, salinity, and soil moisture. Examples of shrubs are skunkbush, greenbrier, plum, oak, blackberry, and pecan.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, wildrice, saltgrass, cordgrass, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include bobwhite quail, meadowlark, field sparrow, cottontail rabbit, and red fox.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, and frogs.

Habitat for rangeland wildlife consists of areas of shrubs and wild herbaceous plants. Wildlife attracted to rangeland include bobwhite quail, deer, coyotes, turkey, cottontail rabbit, and jackrabbit.

Soil properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics. These results are reported in table 18.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering index properties

Table 15 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil series and morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains particles coarser than sand, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (*1*).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as Pt. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index num-

bers range from 0 for the best subgrade material to 20 or higher for the poorest. The AASHTO classification for soils tested, with group index numbers in parentheses, is given in table 18.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an oven-dry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and chemical properties

Table 16 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3 bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or

weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water (*6*). Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion and the amount of soil lost. Soils are grouped according to the following distinctions:

1. Sands, coarse sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.
2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible. Crops can be grown if intensive measures to control wind erosion are used.
3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible. Crops can be grown if intensive measures to control wind erosion are used.

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control wind erosion are used.
5. Loamy soils that are less than 18 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible. Crops can be grown if measures to control wind erosion are used.
6. Loamy soils that are 18 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible. Crops can easily be grown.
7. Silty clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible. Crops can easily be grown.
8. Stony or gravelly soils and other soils not subject to wind erosion.

Soil and water features

Table 17 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams or by runoff from adjacent slopes. Water standing for short periods after rainfall or snowmelt is not considered flooding.

Table 17 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it occurs on an average of once or less in 2 years; and *frequent* that it occurs on an average of more than once in 2

years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 17 are the depth to the seasonal high water table; the kind of water table—that is, perched, artesian, or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 17.

An apparent water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. An artesian water table is under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole. A perched water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Depth to bedrock is shown for all soils that are underlain by bedrock at a depth of 5 to 6 feet or less. For many soils, the limited depth to bedrock is a part of the definition of the soil series. The depths shown are based on measurements made in many soil borings and on other observations during the mapping of the soils. The kind of bedrock and its hardness as related to ease of excavation is also shown. Rippable bedrock can be excavated with a single-tooth ripping attachemnt on a 200-horsepower tractor, but hard bedrock generally requires blasting.

Cemented pans are hard subsurface layers, within a depth of 5 or 6 feet, that are strongly compacted (indurated). Such pans cause difficulty in excavation. The hardness of pans is similar to that of bedrock. A rippable pan can be excavated, but a hard pan generally requires blasting.

Engineering index test data

Table 18 shows laboratory test data for several pedons sampled at carefully selected sites in the survey area. The pedons are typical of the series and are described in the section "Soil series and morphology." The soil samples were tested by the State Department of Highways and Public Transportation.

The testing methods generally are those of the American Association of State Highway and Transportation Officials (AASHTO) or the American Society for Testing and Materials (ASTM).

The tests and methods are: AASHTO classification—M 145 (AASHTO), D 3282 (ASTM); Unified classification—D 2487 (ASTM); Mechanical analysis—T 88 (AASHTO), D2217 (ASTM); Liquid limit—T 89 (AASHTO), D 423 (ASTM); Plasticity index—T 90 (AASHTO), D 424 (ASTM); Moisture density, Method A—T 99 (AASHTO), D 698 (ASTM).

Soil series and morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the Soil Survey Manual (*5*). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (*7*). Unless otherwise stated, colors in the descriptions are for dry soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Soil maps for detailed planning."

Abilene series

The Abilene series consists of deep, loamy soils on broad plains and in shallow valleys of the uplands. They formed in ancient alluvium. Slopes are 0 to 3 percent.

Typical pedon of Abilene clay loam, 1 to 3 percent slopes; from the intersection of Farm Road 586 and U.S. Highway 377; about 10 miles south of Brownwood, 8.1 miles east on Farm Road 586 to intersection with road at Indian Creek community; 3.8 miles north on Indian Creek cemetery road; and 740 feet west of road right-of-way in native pasture:

A1—0 to 10 inches; very dark grayish brown (10YR 3/2) clay loam, very dark brown (10YR 2/2) moist; moderate fine subangular blocky structure; hard, firm;

few siliceous pebbles; mildly alkaline; clear smooth boundary.

B21t—10 to 16 inches; very dark grayish brown (10YR 3/2) clay, very dark brown (10YR 2/2) moist; moderate fine blocky structure; very hard, firm; thin clay films on faces of peds; few siliceous pebbles; mildly alkaline; clear smooth boundary.

B22t—16 to 24 inches; brown (7.5YR 4/2) clay, dark brown (7.5YR 3/2) moist; moderate fine blocky structure; hard, firm; thin clay films on faces of peds; few siliceous pebbles; calcareous in the lower 2 inches; mildly alkaline; gradual wavy boundary.

B23tca—24 to 35 inches; brown (7.5YR 5/2) clay, brown (7.5YR 4/2) moist; moderate fine blocky structure; very hard, firm; few clay films; common films, threads, and few small concretions of calcium carbonate; few small black concretions in the lower 2 inches; few siliceous pebbles; calcareous; moderately alkaline; gradual wavy boundary.

B24tca—35 to 42 inches; brown (10YR 5/3) clay, dark brown (10YR 4/3) moist; few fine faint mottles of yellowish red in the lower 4 inches; moderate fine blocky structure; very hard, firm; few clay films; common concretions and soft bodies of calcium carbonate; few black concretions; calcareous; moderately alkaline; gradual wavy boundary.

C1ca—42 to 53 inches; reddish yellow (7.5YR 6/6) sandy clay, strong brown (7.5YR 5/6) moist; common medium distinct yellowish brown (10YR 5/4) mottles; massive; very hard, firm; few roots; few krotovinas; few concretions of calcium carbonate; estimated calcium carbonate equivalent of this layer is more than 40 percent; calcareous; moderately alkaline; gradual wavy boundary.

C2—53 to 64 inches; very pale brown (10YR 7/4) clay, light yellowish brown (10YR 6/4) moist; massive; extremely hard, firm; about 20 percent soft bodies of calcium carbonate including a few small concretions of calcium carbonate; calcareous; moderately alkaline.

Thickness of the solum ranges from 28 to 60 inches. Soft, powdery forms of calcium carbonate are within a depth of 28 inches. Depth to a calcic horizon is 28 to 60 inches.

The A horizon is dark brown, very dark grayish brown, dark grayish brown, grayish brown, or brown. Reaction is neutral to moderately alkaline.

The B2t and B2tca horizons are clay loam, silty clay loam, or clay. Reaction is neutral to moderately alkaline. The B2t horizon is brown, dark brown, dark grayish brown, or very dark grayish brown. The B2tca horizon is dark grayish brown, brown, grayish brown, or pale brown.

The Cca and C horizons are brown, reddish yellow, pink, light brown, pale brown, light yellowish brown, or very pale brown. They are sandy clay, silty clay loam, clay loam, or clay.

Bastrop series

The Bastrop series consists of deep, loamy soils that formed in old, high terrace deposits in the uplands. Slopes are 1 to 3 percent.

Typical pedon of Bastrop fine sandy loam, 1 to 3 percent slopes; from the intersection of Texas Highway 16 and Farm Road 3023 southwest of Goldthwaite; 5.9 miles southwest on Texas Highway 16; 0.5 mile west and 0.3 mile south on county road; and 2,100 feet west of county road right-of-way in cultivated field:

Ap—0 to 8 inches; brown (7.5YR 5/4), fine sandy loam, dark brown (7.5YR 4/4) moist; single grain; slightly hard, friable; common roots; few very fine siliceous pebbles; slightly acid; abrupt smooth boundary.

A1—8 to 18 inches; light reddish brown (5YR 6/4) fine sandy loam, reddish brown (5YR 4/4) moist; weak fine granular structure; slightly hard, friable; common roots; slightly acid; clear smooth boundary.

B21t—18 to 24 inches; yellowish red (5YR 4/6) sandy clay loam, yellowish red (5YR 3/6) moist; weak fine blocky structure; hard, firm; patchy clay films on surfaces of peds; few very fine siliceous pebbles; neutral; gradual smooth boundary.

B22t—24 to 48 inches; yellowish red (5YR 5/6) sandy clay loam, yellowish red (5YR 3/6) moist; moderate fine blocky structure; hard, firm; patchy clay films on surfaces of peds; neutral; gradual smooth boundary.

B3—48 to 80 inches; yellowish red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) moist; weak fine blocky structure; hard, firm; few films and threads of calcium carbonate in the lower part; calcareous; moderately alkaline; gradual smooth boundary.

Thickness of the solum ranges from about 60 to 90 inches. Content of small siliceous pebbles ranges from none to about 15 percent.

The A horizon is strong brown, light brownish gray, pale brown, light brown, grayish brown, dark grayish brown, yellowish brown, brown, light reddish brown, or reddish brown. Reaction is medium acid to neutral.

The B horizon is reddish brown, red, yellowish red, reddish yellow, light reddish brown, brown, or strong brown. It is sandy clay loam, loam, or clay loam with clay content of about 20 to 30 percent. The B21t horizon is slightly acid or neutral. The B22t horizon is slightly acid to moderately alkaline, and some pedons are calcareous below a depth of 60 inches.

The C horizon, where present, is light brown, reddish yellow, or light reddish brown. It is sandy clay loam, clay loam, or loam.

Bolar series

The Bolar series consists of moderately deep, loamy soils that formed in material weathered from limestone interbedded with clayey marl. Slopes are 1 to 8 percent.

Typical pedon of Bolar clay loam, 2 to 5 percent slopes; from the Mills County Courthouse in Goldthwaite; 10.5 miles south on U.S. Highway 183; 3.3 miles east on county road; 1.0 mile north and west on field road; and about 400 feet south in a cultivated field:

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, friable; common roots; very few small calcium carbonate concretions; calcareous; moderately alkaline; clear smooth boundary.

A1—6 to 12 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular and subangular blocky structure; slightly hard, firm; about 2 percent soft bodies and concretions of calcium carbonate; calcareous; moderately alkaline; clear wavy boundary.

B21—12 to 19 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; moderate fine granular and subangular blocky structure; slightly hard, firm; about 2 percent soft bodies and concretions of calcium carbonate; common fragments of limestone up to 1 inch across; calcareous; moderately alkaline; clear wavy boundary.

B22ca—19 to 30 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; fine granular structure; slightly hard, friable; about 10 percent soft bodies and concretions of calcium carbonate; common fragments of limestone up to 1 inch across; calcareous; moderately alkaline; clear wavy boundary.

R—30 inches; limestone interbedded with calcareous clayey marl.

Thickness of the solum ranges from 20 to 40 inches but is dominantly less than 30 inches. The soil is calcareous and moderately alkaline. The control section contains more than 40 percent calcium carbonate and from 10 to 35 percent limestone fragments or calcium carbonate concretions, mainly less than 6 inches across.

The A horizon is grayish brown, dark grayish brown, very dark grayish brown, brown, or dark brown.

The B horizon is light brown, brown, pale brown, very pale brown, grayish brown, light brownish gray, light gray, yellowish brown, light yellowish brown, light olive brown, or pale yellow. It is loam, clay loam, or silty clay loam with noncarbonate clay content of 20 to 35 percent.

Bonti series

The Bonti series consists of moderately deep, loamy, upland soils that formed in material weathered from sandstone interbedded with clay. Slopes are 1 to 30 percent.

Typical pedon of Bonti stony fine sandy loam; in an area of Bonti-Callahan association, undulating; from the junction of Farm Road 585 and Farm Road 2492 north of Bangs; about 0.4 mile north on Farm Road 585; and 750 feet east of highway right-of-way in a wooded pasture:

A1—0 to 8 inches; brown (7.5YR 5/4) stony fine sandy loam, dark brown (7.5YR 3/2) moist; weak very fine granular structure; hard, friable; common roots; scattered hard sandstone boulders and stones on the surface; neutral; clear smooth boundary.

A2—8 to 11 inches; brown (7.5YR 5/4) fine sandy loam, dark brown (7.5YR 4/4) moist; weak very fine granular structure; hard, friable; common roots; common pores; neutral; abrupt smooth boundary.

B21t—11 to 20 inches; reddish brown (5YR 4/4) clay loam, dark reddish brown (5YR 3/4) moist; moderate coarse prismatic structure parting to moderate medium blocky; very hard, firm; common roots; few pores; continuous clay films on surfaces of peds; medium acid; gradual smooth boundary.

B22t—20 to 38 inches; reddish yellow (7.5YR 6/6) clay loam, strong brown (7.5YR 5/6) moist; moderate coarse prismatic structure parting to moderate medium blocky; very hard, firm; common fine distinct reddish brown mottles; few weakly cemented sandstone fragments in the lower part; continuous clay films on ped surfaces; medium acid; abrupt smooth boundary.

R—38 inches; strong brown, reddish, and yellowish sandstone, weakly cemented in the upper 2 inches, strongly cemented below.

Thickness of the solum ranges from 20 to 40 inches over sandstone. The content of sandstone fragments in the soil ranges from none to about 30 percent, by volume.

The A horizon is brown, yellowish brown, dark yellowish brown, light yellowish brown, light brown, grayish brown, or reddish yellow. It is medium acid through neutral. Texture is stony fine sandy loam or fine sandy loam.

The Bt horizon is red, yellowish red, reddish yellow, reddish brown, or light reddish brown. It ranges from clay loam to clay or sandy clay with 35 to 45 percent clay. Reaction is medium acid or strongly acid. The underlying sandstone is strongly cemented and is interbedded with clay.

Bosque series

The Bosque series consists of deep, loamy soils on flood plains. These soils formed in calcareous alluvial sediment. Slopes are 0 to 1 percent.

Typical pedon of Bosque loam, occasionally flooded; from the intersection of Farm Road 1467 and U.S. Highway 183 north of Owens; 2.5 miles east on Farm Road 1467; and 100 feet south in a cultivated field:

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine

granular structure; hard, friable; common roots; calcareous; moderately alkaline; abrupt smooth boundary.

A11—5 to 18 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; hard, friable; common worm casts; calcareous; moderately alkaline; gradual smooth boundary.

A12—18 to 26 inches; brown (10YR 4/3) loam, dark brown (10YR 3/3) moist; moderate fine granular structure; hard, friable; common worm casts; few films and threads of calcium carbonate; calcareous; moderately alkaline; gradual smooth boundary.

B21—26 to 48 inches; brown (10YR 5/3) loam, brown (10YR 4/3) moist; weak fine granular structure; slightly hard, friable; common films and threads of calcium carbonate; calcareous; moderately alkaline; gradual smooth boundary.

B22—48 to 64 inches; light yellowish brown (10YR 6/4) loam, yellowish brown (10YR 5/4) moist; weak fine granular structure; slightly hard, friable; calcareous; moderately alkaline.

The average texture of the 10- to 40-inch control section ranges from loam to clay loam, and the clay content is 20 to 35 percent. Some pedons contain a few fine siliceous or limestone pebbles.

The A horizon is brown, dark brown, grayish brown, dark grayish brown, or very dark grayish brown.

The B horizon is light brown, brown, pale brown, very pale brown, grayish brown, light brownish gray, or light yellowish brown. It is loam or clay loam, and lenses of fine sandy loam are present in some pedons.

Brackett series

The Brackett series consists of shallow, loamy, upland soils that formed in calcareous loams that are underlain by chalky limestone and calcareous earth. Slopes are 1 to 30 percent.

Typical pedon of Brackett gravelly loam, in an area of Bolar-Brackett association, undulating; from the intersection of Texas Highway Loop 15 and Farm Road 572 in Goldthwaite; about 12 miles south on Farm Road 572; 2.0 miles south and east on private ranch road; and 900 feet north in rangeland:

A1—0 to 5 inches; grayish brown (10YR 5/2) gravelly loam, dark grayish brown (10YR 4/2) moist; moderate fine subangular blocky structure; hard, friable; about 28 percent by volume limestone fragments mostly 1/4 inch to 3 inches across; about 30 percent of the surface covered with limestone fragments 1/4 inch to 7 inches across; calcareous; moderately alkaline; clear smooth boundary.

B2—5 to 17 inches; light brownish gray (2.5Y 6/2) gravelly loam, grayish brown (2.5Y 5/2) moist; moderate fine subangular blocky structure; hard, friable; about 24 percent by volume concretions; soft fragments of limestone mostly less than 3 inches across; calcareous; moderately alkaline; clear smooth boundary.

Cr—17 to 41 inches; pale yellow (2.5Y 7/4) thinly bedded, weakly cemented limestone and calcareous earth.

Thickness of the solum over interbedded limestone and limy earth ranges from 10 to 20 inches. Weakly to strongly cemented limestone fragments that range from gravel size to 7 inches across range from few to 35 percent, by volume. Calcium carbonate equivalent to a depth of 40 inches or more exceeds 40 percent, excluding fragments more than 3 inches across. The solum is gravelly loam or gravelly clay loam with clay content of 18 to 35 percent. A surface pavement of limestone fragments 1 inch to 4 inches thick is generally present on hilly topography.

The A horizon is brown, grayish brown, light yellowish brown, light brownish gray, pale brown, very pale brown, or light gray. The B horizon is grayish brown, brown, yellowish brown, light brownish gray, pale brown, light yellowish brown, light gray, very pale brown, or pale yellow.

The Cr horizon consists of limy earth interbedded with thin layers of limestone. Texture of the fine earth fraction is loam or clay loam. Limestone makes up as much as 80 percent of the Cr horizon.

Callahan series

The Callahan series consists of moderately deep, loamy, upland soils that formed in material weathered from interbedded shaly clay. Slopes are 1 to 8 percent.

Typical pedon of Callahan loam, 1 to 3 percent slopes; from the junction of Texas Highway 279 and Farm Road 2940 in Cross Cut; about 0.9 mile north on Texas Highway 279; 800 feet east on private road; and 300 feet north in pasture:

Ap—0 to 4 inches; brown (7.5YR 4/4) loam, dark brown (7.5YR 3/4) moist; weak fine granular structure; hard, firm; few fine roots; neutral; abrupt smooth boundary.

B21tca—4 to 19 inches; reddish brown (5YR 4/4) clay, dark reddish brown (5YR 3/4) moist; ped faces slightly darker; moderate medium and fine blocky structure; very hard, very firm; few fine roots; continuous clay films on ped surfaces; moderately alkaline; clear smooth boundary.

B22t—19 to 38 inches; brown (7.5YR 4/4) clay, brown (7.5YR 4/4) moist; moderate fine blocky structure; very hard, firm; few fine roots; clay films on ped surfaces; few small concretions and soft bodies of calcium carbonate; few partially weathered shale fragments; calcareous; moderately alkaline; gradual smooth boundary.

Cr—38 to 65 inches; light olive brown (2.5Y 5/4) shaly clay, olive brown (2.5Y 4/4) moist; massive;

common concretions and soft bodies of calcium carbonate; calcareous; moderately alkaline.

Thickness of the solum ranges from 24 to 40 inches. Secondary carbonates in the form of soft powdery bodies and films and threads are within a depth of 18 to 28 inches. The content of coarse fragments is less than 10 percent.

The A horizon is reddish brown or brown. Reaction is neutral to moderately alkaline. The Bt horizon is dark reddish brown, brown, reddish brown, or yellowish red. It is clay loam or clay. Clay content in the control section ranges from 35 to 50 percent. Reaction is mildly alkaline or moderately alkaline.

The C horizon is calcareous shaly clay. In some pedons this horizon is weakly cemented sandstone interbedded with shale.

Caradan series

The Caradan series consists of deep, loamy, upland soils. These soils formed in a thin mantle of clay over calcareous, loamy earth. Slopes are 1 to 3 percent.

Typical pedon of Caradan clay loam, 1 to 3 percent slopes; from the County Courthouse of Goldthwaite; about 2.5 miles north on Texas Highway 16 to the intersection of Texas Highway 16 and U.S. Highway 84; 7.6 miles north on Texas Highway 16; 2.0 miles east on county road; and 975 feet northeast of county road right-of-way in native pasture:

A1—0 to 4 inches; brown (7.5YR 4/2) clay loam, dark brown (7.5YR 3/2) moist; weak medium subangular blocky structure; hard, firm, sticky and plastic; common fine roots; few fine pores; 5 percent fragments of chert 1/4 inch to 6 inches across in the soil and on the surface; neutral; clear smooth boundary.

B21t—4 to 18 inches; reddish brown (2.5YR 4/4) clay, dark reddish brown (2.5YR 3/4) moist; moderately fine angular blocky structure; extremely hard, very firm, sticky and plastic; common fine roots; few fine pores; thin continuous clay films on faces of peds; shiny faces on peds; common dark vertical streaks; slightly acid; gradual smooth boundary.

B22t—18 to 25 inches; reddish brown (5YR 4/3) clay, dark reddish brown (5YR 3/3) moist; moderate medium subangular blocky structure; extremely hard, very firm, sticky and plastic; few fine roots; few fine pores; thin continuous clay films on faces of peds; few dark vertical streaks 1/4 inch thick at a depth of 20 inches; few medium and coarse fragments of chert; mildly alkaline; clear smooth boundary.

B23tca—25 to 36 inches; reddish brown (5YR 4/4) clay loam, dark reddish brown (5YR 3/4) moist; weak medium subangular blocky structure; hard, firm, sticky and plastic; few fine roots; common fine soft bodies and few fine concretions of calcium carbonate; calcareous; moderately alkaline; clear smooth boundary.

C—36 to 62 inches; pink (7.5YR 8/4) silt loam, pink (7.5YR 7/4) moist; massive; soft, very friable, sticky; few pockets of clay about 1/2 inch thick; about 70 percent calcium carbonate equivalent; calcareous; moderately alkaline; gradual smooth boundary.

Thickness of the solum ranges from 24 to 55 inches. Chert fragments of gravel to cobble size range from few to 20 percent by volume in the soil or on the surface. When the soil is dry, cracks 0.5 to 1 inch wide extend to a depth of 20 to 30 inches. Free carbonates are below a depth of 15 inches but within a depth of 28 inches.

The A horizon is dark brown, dark reddish brown, very dark grayish brown, dark grayish brown, or brown. Reaction is slightly acid to mildly alkaline.

The B21t horizon is reddish brown, brown, yellowish red, red, or dark red. The B22t horizon is brown, dark brown, dark grayish brown, reddish brown, or dark reddish brown. The B21t and B22t horizons are clay, and reaction is slightly acid to mildly alkaline.

The B23tca horizon and the C horizon are clayey or loamy, calcareous material. Some pedons are underlain by limestone at a depth of 60 to 80 inches.

Chaney series

The Chaney series consists of deep, sandy, upland soils. These soils formed in material weathered from clay and soft sandstone. Slopes are 1 to 5 percent.

Typical pedon of Chaney loamy fine sand, 1 to 5 percent slopes; from the junction of Farm Road 2940 and Texas Highway 279 at Cross Cut; about 3.5 miles north on Texas Highway 279; 2.0 miles east and south on county road; and 200 feet south in wooded rangeland:

A1—0 to 6 inches; brown (10YR 4/3) loamy fine sand, dark brown (10YR 3/3) moist; weak granular structure; slightly hard, very friable; many fine roots; decaying leaves; few fine siliceous pebbles; slightly acid; clear smooth boundary.

A2—6 to 18 inches; very pale brown (10YR 7/3) loamy fine sand, pale brown (10YR 6/3) moist; single grain; slightly hard, very friable; few fine roots; few fine siliceous pebbles; slightly acid; abrupt wavy boundary.

B2t—18 to 44 inches; brownish yellow (10YR 6/6) sandy clay, yellowish brown (10YR 5/6) moist; common medium distinct yellowish red (5YR 4/6) and gray (10YR 6/1) mottles; few coarse prominent red (2.5YR 4/6) mottles; moderate medium blocky structure; very hard, firm; continuous clay films on faces of peds and sand grains; few fine siliceous pebbles; medium acid; gradual smooth boundary.

C—44 to 60 inches; light gray (10YR 7/2) sandy clay, light brownish gray (10YR 6/2) moist; massive;

common rounded siliceous pebbles; thin layers of packsand; slightly acid.

Thickness of the solum ranges from 30 to 60 inches. The A1 horizon is light brown, brown, grayish brown, dark grayish brown, pale brown, very pale brown, or light brownish gray. Value in the A2 horizon is 1 to 3 units less than in the A1 horizon. Cultivation generally mixes the A1 and A2 horizons. The A horizon is neutral to medium acid.

The B2t horizon is reddish brown, red, dark red, yellowish red, reddish yellow, or brownish yellow. It has prominent grayish or brownish mottles, and in some pedons the B2t horizon has a mottled matrix of reds, yellows, browns, and grays throughout. The B2t horizon is sandy clay or clay with a clay content of 35 to 50 percent. Reaction is neutral to medium acid. The B3 horizon, where present, has brownish yellow, red, pale brown, or gray mottles. It is sandy clay loam or sandy clay.

The C horizon is clay, sandy clay loam, or sandy clay. Some pedons have thin, weakly cemented discontinuous sandstone layers in the C horizon and others have shaly clay. Reaction is moderately alkaline to medium acid. Some pedons contain a few films, threads, or soft bodies of calcium carbonate in the C horizon.

Cisco series

The Cisco series consists of deep, loamy, upland soils that formed in loamy and sandy material. Slopes are 1 to 5 percent.

Typical pedon of Cisco fine sandy loam, 1 to 3 percent slopes; from the common intersection of U.S. Highway 183, a county road and Farm Road 1689 in May; about 1.1 miles west on the county road to intersection with another county road; 350 feet south on county road; and 1,400 feet east in a cultivated field:

Ap—0 to 8 inches; brown (7.5YR 5/4) fine sandy loam, dark brown (7.5YR 4/4) moist; weak granular structure; hard, friable; common fine roots; neutral; abrupt smooth boundary.

B21t—8 to 26 inches; reddish brown (5YR 4/4) sandy clay loam, dark reddish brown (5YR 3/4) moist; moderate very fine subangular blocky structure; hard, firm; few patchy clay films on faces of peds; neutral; gradual smooth boundary.

B22t—26 to 38 inches; reddish brown (5YR 4/4) sandy clay loam, dark reddish brown (5YR 3/4) moist; moderate very fine subangular blocky structure; hard, firm; continuous clay films on faces of peds; neutral; gradual smooth boundary.

B23t—38 to 46 inches; reddish brown (5YR 5/4) sandy clay loam, reddish brown (5YR 4/4) moist; weak very fine subangular blocky structure; hard, firm; clay films bridge sand grains; neutral; clear smooth boundary.

Cca—46 to 63 inches; reddish yellow (7.5YR 7/6) loam; massive; slightly hard, friable; about 15 percent segregated calcium carbonate in concretions and soft bodies; calcareous; moderately alkaline.

Thickness of the solum ranges from 40 to 70 inches. Secondary carbonates are at a depth of 36 to 60 inches.

The A horizon is brown, light brown, dark grayish brown, grayish brown, light brownish gray, strong brown, pale brown, yellowish brown, or light yellowish brown. It is fine sandy loam or loamy fine sand. Some pedons have an A2 horizon that has value 1 to 2 units higher than that of the A1 horizon. The A horizon is slightly acid or neutral.

The B2t horizon is reddish brown, yellowish red, or red. It is sandy clay loam or clay loam. The clay content is about 20 to 35 percent. Reaction is slightly acid or neutral.

The C horizon is sandy clay loam, fine sandy loam, or loam interbedded with weakly cemented packsand. Reaction is mildly alkaline or moderately alkaline.

Clairemont series

The Clairemont series consists of deep, loamy soils on flood plains. These soils formed in calcareous, loamy alluvium. Slopes are 0 to 1 percent.

Typical pedon of Clairemont silt loam, in an area of Clairemont soils, frequently flooded; from the intersection of Texas Highway 16 and Farm Road 3023 southwest of Goldthwaite; about 7.5 miles southwest on Texas Highway 16; and 800 feet east of the highway in native pastureland:

A1—0 to 14 inches; reddish brown (5YR 4/4) silt loam, dark reddish brown (5YR 3/4) moist; weak fine granular structure; soft, friable; common roots; many fine and medium pores; calcareous; moderately alkaline; abrupt smooth boundary.

C1—14 to 22 inches; reddish brown (5YR 5/4) silt loam, reddish brown (5YR 4/4) moist; massive; slightly hard, friable; common thin horizontal strata of silty clay loam and loamy fine sand; few earthworm channels; few films and threads of calcium carbonate; calcareous; moderately alkaline; gradual smooth boundary.

C2—22 to 62 inches; light reddish brown (5YR 6/4) silt loam, reddish brown (5YR 4/4) moist; massive; soft, friable; common horizontal strata of fine sandy loam from 1/2 inch to 4 inches thick; common films and threads of calcium carbonate; calcareous; moderately alkaline.

The A horizon is reddish brown, light reddish brown, yellowish red, brown, or reddish yellow. The C horizon is light brown, light reddish brown, reddish brown, yellowish red, or reddish yellow. It is silt loam or silty clay loam. Thin strata of coarser or finer material are throughout the C horizon.

Deleon series

The Deleon series consists of deep, clayey soils on flood plains. These soils formed in calcareous, clayey alluvium. Slopes are 0 to 1 percent.

Typical pedon of Deleon silty clay; from the intersection of Farm Road 2126, Farm Road 2524, and county road southeast of Brownwood; about 4.0 miles southeast, 1.9 miles northeast, and 0.8 mile southeast on county road; 0.4 mile southwest and southeast on private road to ranch house; and 3,300 feet south of ranch house in cultivated field:

Ap—0 to 6 inches; very dark grayish brown (10YR 3/2) silty clay, very dark brown (10YR 2/2) moist; moderate medium subangular blocky structure; very hard, very firm; common roots and pores; surface cracks when dry; calcareous; moderately alkaline; abrupt smooth boundary.

A11—6 to 26 inches; very dark grayish brown (10YR 3/2) silty clay, very dark brown (10YR 2/2) moist; moderate medium angular blocky structure; very hard, very firm; common roots; evidence of old, filled cracks extending below 20 inches; calcareous; moderately alkaline; gradual smooth boundary.

A12—26 to 44 inches; dark grayish brown (10YR 4/2) silty clay, very dark grayish brown (10YR 3/2) moist; moderate coarse angular blocky structure; very hard, very firm; common fine roots; few pressure faces and small slickensides that do not intersect; calcareous; moderately alkaline; gradual smooth boundary.

A13—44 to 66 inches; brown (7.5YR 5/2) silty clay, dark brown (7.5YR 3/2) moist; weak medium blocky structure; very hard, very firm; few fine roots; few fine and medium soft bodies of calcium carbonate; calcareous; moderately alkaline; gradual smooth boundary.

C—66 to 80 inches; brown (7.5YR 5/4) silty clay, dark brown (7.5YR 4/4) moist; massive; very hard, very firm; calcareous; moderately alkaline.

Thickness of the solum ranges from 40 to 70 inches or more. Cracks 0.5 to 1 inch wide extend to a depth of more than 20 inches. In some pedons the A1 horizon is noncalcareous.

The A horizon is dark grayish brown, very dark grayish brown, or dark brown in the upper part and brown, yellowish brown, or light brown at a depth of more than 20 inches. Clay content of the 10- to 40-inch control section ranges from 40 to 55 percent.

The C horizon contains strata of loamy or sandy material at a depth of more than 80 inches.

Denton series

The Denton series consists of moderately deep, clayey, upland soils that formed in clayey material over limestone. Slopes are 1 to 3 percent.

Typical pedon of Denton silty clay, 1 to 3 percent slopes; from the intersection of Farm Road 575 and Farm Road 2005 northeast of Goldthwaite; about 4.5 miles north on Farm Road 575; 3.5 miles northeast and 1.2 miles east on county road; 0.3 mile east on private road; and 400 feet south in cultivated field:

Ap—0 to 4 inches; very dark grayish brown (10YR 3/2) silty clay, very dark brown (10YR 2/2) moist; moderate fine granular structure; slightly hard, firm, sticky and plastic; common roots; few fine chert fragments; calcareous; moderately alkaline; abrupt smooth boundary.

A11—4 to 16 inches; very dark grayish brown (10YR 3/2) silty clay, very dark brown (10YR 2/2) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; evidence of old cracks that are now filled with material from horizon above; few fine limestone fragments; common concretions and soft bodies of calcium carbonate; calcareous; moderately alkaline; gradual smooth boundary.

A12—16 to 28 inches; brown (7.5YR 4/2) silty clay, dark brown (7.5YR 3/2) moist; moderate fine subangular blocky structure; hard, firm, slightly sticky; evidence of cracks extending below 20 inches; about 10 percent limestone fragments mainly less than 1 inch wide; common concretions and soft bodies of calcium carbonate; calcareous; moderately alkaline; clear smooth boundary.

R—28 inches; hard, nodular, fractured limestone coated with calcium carbonate; limestone has common pendants.

Thickness of the solum ranges from 22 to 40 inches over limestone bedrock. Clay content ranges from 35 to 55 percent.

The A horizon is dark brown, brown, dark grayish brown, or very dark grayish brown.

Value and chroma in the B horizon, where present, is one or two units higher than in the A horizon. The B horizon is silty clay, clay, or silty clay loam. Stone lines are in the B horizon of some pedons.

The R layer ranges from fractured limestone bedrock interbedded with calcareous, clayey marl to beds of limestone rubble with clayey marl filling the interstices.

Desan series

The Desan series consists of deep, sandy, upland soils. These soils formed in thick beds of sandy and loamy materials. Slopes are 0 to 5 percent.

Typical pedon of Desan loamy fine sand, 0 to 5 percent slopes; from the Mills County Courthouse in Goldthwaite; about 10 miles southwest on Texas Highway 16; 1.3 miles west on a county road to the Lower Big Valley Cemetery; 0.5 mile north and 0.5 mile east to a field corner; and 240 feet southeast in a pecan orchard:

Ap—0 to 8 inches; brown (10YR 5/3) loamy fine sand, dark brown (10YR 4/3) moist; single grain; loose, very friable; common fine and medium roots; slightly acid; abrupt smooth boundary.

A2—8 to 54 inches; reddish yellow (7.5YR 6/6) loamy fine sand, strong brown (7.5YR 5/6) moist; single grain; loose, very friable; few fine and medium roots; medium acid; clear wavy boundary.

B21t—54 to 76 inches; yellowish red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) moist; moderate coarse prismatic structure parting to moderate coarse subangular blocky; very hard, firm; few fine roots; common fine and medium pores; thin patchy clay films on faces of peds; slightly acid; clear wavy boundary.

B22t—76 to 80 inches; yellowish red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) moist; moderate coarse prismatic structure parting to coarse subangular blocky; very hard, firm; few fine roots; many fine and medium pores; patchy clay films on faces of peds; medium acid.

Thickness of the solum ranges from 65 to 120 inches or more. The A1 horizon is grayish brown, brown, pale brown, yellowish brown, or dark yellowish brown. The A2 horizon is very pale brown, brownish yellow, pink, or reddish yellow. The combined thickness of the A1 and A2 horizons is 40 to 60 inches or more. Reaction is strongly acid to neutral.

The B21t horizon is yellowish red, reddish yellow, or red. The B22t horizon is yellowish red or reddish yellow. Texture is sandy clay loam, and reaction is slightly acid to strongly acid. The B3 horizon, where present, is fine sandy loam, loam, or sandy clay loam, and it is medium acid or strongly acid.

The C horizon, where present, is yellowish red, reddish yellow, light brown, light yellowish brown, or very pale brown. It is loamy fine sand, loamy sand, sandy loam, or loam.

Doudle series

The Doudle series consists of moderately deep, loamy, upland soils. These soils formed in weakly consolidated, calcareous sandstone and loamy earth. Slopes are 1 to 8 percent.

Typical pedon of Doudle cobbly loam, in an area of Doudle-Real association, undulating; from the intersection of Farm Road 45 and Indian Creek Road, which is about 3.3 miles northeast of Indian Creek Community; about 0.1 mile north on Farm Road 45; 0.8 mile northeast and 0.5 mile southeast on county road; and 200 feet southwest of the county road right-of-way in rangeland just south of small caliche pit:

A1—0 to 6 inches; brown (7.5YR 5/2) cobbly loam, dark brown (7.5YR 3/2) moist; moderate very fine subangular blocky structure; hard, friable; common fine roots; common fine pores; few fragments of caliche ranging up to about 2 inches in thickness; about 20 percent by volume caliche and calcareous sandstone cobbles; calcareous; moderately alkaline; clear smooth boundary.

B21ca—6 to 13 inches; light brown (7.5YR 6/4) loam, brown (7.5YR 5/4) moist; moderate very fine subangular blocky structure; hard, friable; common fine roots; common fine pores; common weakly cemented bodies of calcium carbonate; common medium concretions of calcium carbonate; common fragments of caliche and calcareous sandstone, which range from about 3 to 12 inches across and are 2 inches thick; calcareous; moderately alkaline; clear smooth boundary.

B22ca—13 to 36 inches; pink (5YR 7/4) silt loam, reddish yellow (5YR 6/6) moist; weak very fine subangular blocky structure; hard, friable; common fine roots and few coarse roots; common fine pores; medium bodies of calcium carbonate make up about 15 percent of the horizon; few medium concretions of carbonate; few fine fragments of caliche; calcareous; moderately alkaline; clear smooth boundary.

Cr&Cca—36 to 48 inches; stratified reddish yellow and pink weakly cemented fine grain calcareous sandstone and pink (5YR 7/4) silt loam; massive; sandstone is hard when dry, brittle and weakly cemented when moist; common medium soft bodies of calcium carbonate; calcareous; moderately alkaline; gradual smooth boundary.

C—48 to 60 inches; stratified light reddish brown (5YR 6/4) loam and clay loam, reddish brown (5YR 5/4) moist; massive; slightly hard, friable; common lenses and pockets of dusky red, weak red, pale red, and pinkish gray; few strongly cemented fragments of calcareous sandstone; estimated more than 40 percent calcium carbonate equivalent; calcareous; moderately alkaline.

Thickness of the solum ranges from 22 to 40 inches above the paralithic contact with sandstone. Clay content, within the control section, ranges from 8 to 18 percent. The calcium carbonate equivalent ranges from 40 to 60 percent.

The A horizon is grayish brown, dark grayish brown, brown, dark reddish gray, or reddish brown. Pedons with moist value and chroma of less than 3.5 have an A horizon less than 7 inches thick. Reaction is mildly alkaline or moderately alkaline.

The B2 horizon is brown, grayish brown, light brownish gray, pale brown, yellowish brown, light yellowish brown, very pale brown, light brown, pinkish gray, pink, yellowish red, reddish brown, light reddish brown, or reddish yellow. It is loam, silt loam, or very fine sandy loam.

The C horizon ranges from weakly cemented to strongly cemented, calcareous, pink sandstone interbedded with loam and clay loam.

Energy series

The Energy series consists of deep, loamy soils that formed in stratified, calcareous alluvium on flood plains. Slopes are 0 to 1 percent.

Typical pedon of Energy fine sandy loam, occasionally flooded; from the intersection of Texas Highway 279 and Park Road 15 northwest of Brownwood; about 0.7 mile east on Park Road 15 and 100 feet north of road in pastureland:

A1—0 to 8 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 5/3) moist; weak fine subangular blocky structure; hard, friable; common roots; calcareous; moderately alkaline; abrupt smooth boundary.

C1—8 to 24 inches; brown (10YR 5/3) sandy clay loam, dark brown (10YR 4/3) moist; massive; hard, firm; weak bedding planes evident; calcareous; moderately alkaline; abrupt smooth boundary.

C2—24 to 48 inches; yellowish brown (10YR 5/4) sandy clay loam, dark yellowish brown (10YR 4/4) moist; massive; hard, firm; strata of fine sandy loam with evident bedding planes; calcareous; moderately alkaline; abrupt smooth boundary.

C3—48 to 80 inches; brown (7.5YR 5/4) sandy clay loam, dark brown (7.5YR 4/4) moist; massive; hard, firm; evident bedding planes; calcareous; moderately alkaline.

The A horizon is light yellowish brown, pale brown, light brownish gray, grayish brown, brown, or dark grayish brown. Where the A horizon has moist colors of 3.5 or less, it is less than 10 inches thick.

The C horizon is brown, light brown, pale brown, very pale brown, light brownish gray, grayish brown, or yellowish brown. Few thin strata of very dark grayish brown or dark brown may also occur in the 10- to 40-inch control section. The C horizon is stratified clay loam to fine sandy loam, and reaction is moderately alkaline. Stratification varies from scarcely evident to pronounced.

Frio series

The Frio series consists of deep, loamy soils that formed in calcareous alluvium on flood plains. Slopes are 0 to 1 percent.

Typical pedon of Frio silty clay loam, occasionally flooded; from southeast corner of Brown County Courthouse in Brownwood; about 0.3 mile east and northeast to intersection with U.S. Pecan Field Station Road; 0.6 mile southeast on field road; and 1,200 feet northeast in pecan orchard:

Ap—0 to 7 inches; brown (10YR 4/3) silty clay loam, dark brown (10YR 3/3) moist; weak granular structure; hard, firm; common roots; calcareous; moderately alkaline; abrupt smooth boundary.

A11—7 to 22 inches; dark brown (10YR 3/3) silty clay, very dark brown (10YR 2/2) moist; moderate very fine subangular blocky structure; very hard, firm; common roots; films and threads of calcium carbonate in lower part; calcareous; moderately alkaline; gradual smooth boundary.

A12—22 to 34 inches; brown (10YR 4/3) silty clay, dark brown (10YR 3/3) moist; moderate very fine subangular blocky structure; very hard, firm; films and threads of calcium carbonate; calcareous; moderately alkaline; diffuse smooth boundary.

C—34 to 72 inches; yellowish brown (10YR 5/4) silty clay, dark yellowish brown (10YR 4/4) moist; massive; hard, firm; films and threads of calcium carbonate; calcareous; moderately alkaline.

Thickness of the solum ranges from 22 to 58 inches. The 10- to 40-inch control section is silty clay loam, clay loam, or silty clay and has 35 to 45 percent clay.

The A horizon is brown, dark brown, grayish brown, dark grayish brown, or very dark grayish brown.

The B horizon, where present, is one or two units of value higher than the A horizon. It is silty clay loam or silty clay and is calcareous. Reaction is moderately alkaline.

The C horizon is yellowish brown, dark yellowish brown, light brown, brown, or light brownish gray. It is silty clay, clay loam, or gravelly clay loam and is calcareous. Reaction is moderately alkaline.

Heaton series

The Heaton series consists of deep, sandy upland soils. These soils formed in thick beds of sandy material. Slopes are 0 to 3 percent but are dominantly about 1 percent.

Typical pedon of Heaton loamy fine sand, 0 to 3 percent slopes; from the intersection of Texas Highway 16 and Farm Road 3023 southwest of Goldthwaite; about 10 miles southwest on Texas Highway 16; 1.3 miles west on a county road to the Lower Big Valley Cemetery; 0.5 mile east, 2,100 feet north, and 300 feet east in a pecan orchard:

A1—0 to 10 inches; pale brown (10YR 6/3) loamy fine sand, brown (10YR 5/3) moist; single grain; loose, very friable; few fine roots; medium acid; abrupt smooth boundary.

A2—10 to 30 inches; light brown (7.5YR 6/4) loamy fine sand, brown (7.5YR 5/4) moist; single grain; loose, very friable; few fine roots; medium acid; abrupt wavy boundary.

B21t—30 to 55 inches; red (2.5YR 5/6) sandy clay loam; red (2.5YR 4/6) moist; coarse prismatic and moderate medium subangular blocky structure; very hard, firm; patchy clay films on faces of peds; common fine and medium pores; medium acid; gradual wavy boundary.

B22t—55 to 80 inches; yellowish red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) moist; coarse

prismatic and moderate medium and coarse subangular blocky structure; very hard, firm; patchy clay films; common fine and medium pores; few skeletans and clean sand grains; slightly acid.

Thickness of the solum ranges from 60 to 100 inches or more. Reaction is neutral to medium acid. The A horizon is 20 to 40 inches thick and is brown, light brown, very pale brown, pale brown, or grayish brown.

The B2 horizon is red, yellowish red, reddish yellow, or reddish brown and is sandy clay loam. The B3 horizon, where present, is sandy clay loam or fine sandy loam. Clean sand grains or skeletans are in most pedons.

Hext series

The Hext series consists of moderately deep, loamy, upland soils that formed in weakly cemented calcareous sandstone interbedded with calcareous, loamy earth. Slopes are 1 to 8 percent.

Typical pedon of Hext loam, 1 to 3 percent slopes; from the intersection of U.S. Highways 67 and 84 and Farm Road 1849 east of Bangs; about 0.5 mile north on Farm Road 1849; and 100 feet west of road in idle cropland:

Ap—0 to 7 inches; brown (7.5YR 4/2) loam, dark brown (7.5YR 3/2) moist; weak fine granular structure; slightly hard, friable; common fine roots; about 2 percent by volume limestone fragments less than 2 inches across; calcareous; moderately alkaline; abrupt smooth boundary.

B2—7 to 24 inches; brown (7.5YR 5/4) loam, brown (7.5YR 4/4) moist; weak fine granular structure; slightly hard, friable; about 5 percent by volume limestone fragments less than 3 inches across; common films and threads of calcium carbonate; calcareous; moderately alkaline; gradual wavy boundary.

Cr&Cca—24 to 38 inches; weakly cemented siltstone with horizontal bedding planes stratified with light reddish brown (5YR 6/4) loam; massive; common films and threads of calcium carbonate; about 30 percent calcium carbonate equivalent; calcareous; moderately alkaline.

Thickness of the solum and depth to a paralithic or calcic horizon that has calcium carbonate equivalent of 15 to 40 percent range from 20 to 40 inches. Siliceous or limestone pebbles make up 0 to 15 percent of any horizon.

The A horizon is grayish brown, light brownish gray, pale brown, or brown. Reaction is mildly alkaline or moderately alkaline.

The B2 horizon is pink, light brown, pale brown, very pale brown, light yellowish brown, reddish brown, or brown. It is loam, fine sandy loam, or sandy clay loam.

The C horizon is light brown, brown, light reddish brown, or reddish yellow. It is weakly cemented sandy marl, siltstone, or sandstone.

Kavett series

The Kavett series consists of shallow, clayey upland soils. These soils formed in a clayey mantle over limestone and interbedded marl. Slopes are 1 to 3 percent.

Typical pedon of Kavett silty clay, 1 to 3 percent slopes; from the intersection of Farm Road 1176 and Farm Road 586 in the Mount View community southwest of Brownwood; about 2.3 miles south on Farm Road 586; and 1,800 feet west in a cultivated field:

Ap—0 to 10 inches; brown (7.5YR 4/2) silty clay, dark brown (7.5YR 3/2) moist; weak fine subangular blocky structure; hard, firm; few caliche coated limestone pebbles and cobbles on the surface; calcareous; moderately alkaline; clear wavy boundary.

A1—10 to 16 inches; brown (7.5YR 5/2) silty clay, brown (7.5YR 4/2) moist; moderate fine subangular blocky structure; hard, firm; about 5 to 10 percent limestone fragments mainly less than 1/4 inch across; calcareous; moderately alkaline; abrupt smooth boundary.

Ccam—16 to 19 inches; strongly cemented caliche.

R—19 inches; hard, pinkish limestone with secondary coatings of hardened calcium carbonate on the lower side.

Thickness of the solum ranges from 10 to 20 inches. Limestone fragments of pebble and cobble size are on the surface and in the solum. The content of these fragments ranges from less than 1 percent to about 15 percent. Clay content ranges from about 35 to 45 percent.

The A horizon is grayish brown, dark grayish brown, very dark grayish brown, dark brown, or brown. The petrocalcic horizon is mainly a bed of indurated caliche fragments with pendants on the lower side. These fragments are as much as 2 feet across and 5 inches thick. The underlying limestone is also coated with strongly cemented caliche that ranges from 1/4 inch to 2 inches in thickness.

Krum series

The Krum series consists of deep, clayey upland soils. These soils formed in thick beds of calcareous, clayey sediment in shallow valleys. Slopes are 1 to 3 percent.

Typical pedon of Krum silty clay, 1 to 3 percent slopes; from the intersection of Texas Highway Loop 15 and Farm Road 572 in Goldthwaite; about 9.5 miles southeast on Farm Road 572 to intersection with private road (one mile north of Pleasant Grove Church); 0.6 mile north on private road; and 1,500 feet west in rangeland:

A11—0 to 8 inches; very dark grayish brown (10YR 3/2) silty clay, very dark brown (10YR 2/2) moist; moder-

ate fine subangular blocky structure; hard, firm, slightly sticky and plastic; common fine roots; few fine pores; common very fine fragments of limestone; calcareous; moderately alkaline; clear smooth boundary.

A12—8 to 17 inches; dark grayish brown (10YR 4/2) silty clay, very dark grayish brown (10YR 3/2) moist; moderate fine subangular blocky structure; hard, firm, slightly sticky and plastic; common fine roots; few medium pores; few fine limestone fragments; shiny pressure faces in lower part; calcareous; moderately alkaline; gradual smooth boundary.

A13—17 to 34 inches; dark grayish brown (10YR 4/2) silty clay, very dark grayish brown (10YR 3/2) moist; moderate medium angular blocky structure; hard, very firm, sticky and plastic; few fine roots; few fine limestone fragments; vertical streaks of dark material in filled cracks; few films and threads of calcium carbonate; calcareous; moderately alkaline; gradual smooth boundary.

B21—34 to 58 inches; yellowish brown (10YR 5/4) silty clay, dark yellowish brown (10YR 4/4) moist; moderate medium angular blocky structure; hard, firm, sticky and plastic; few fine roots; few films and threads of calcium carbonate; calcareous; moderately alkaline; gradual smooth boundary.

B22ca—58 to 68 inches; yellowish brown (10YR 5/4) silty clay, dark yellowish brown (10YR 4/4) moist; moderate fine subangular blocky structure; hard, firm, sticky and plastic; common fine limestone fragments; common films, threads, and soft bodies of calcium carbonate; calcareous; moderately alkaline.

Thickness of the solum ranges from 38 to 70 inches. These soils, when dry, have cracks of 0.4 inch to 1.2 inches wide that extend from the surface to a depth of more than 24 inches. The control section contains 40 to 60 percent clay.

The A horizon is very dark grayish brown, dark grayish brown, grayish brown, dark gray, brown, or dark brown. Thickness of the horizon that has moist value and chroma of less than 3.5 is more than 20 inches.

The B horizon is brown, grayish brown, pale brown, yellowish brown, light yellowish brown, light brown, or reddish brown. Visible concretions and soft bodies of calcium carbonate range from less than 1 percent to about 10 percent, by volume. Texture is silty clay or clay.

Leeray series

The Leeray series consists of deep, clayey upland soils. These soils formed in thick beds of brownish, calcareous clay. Slopes are 0 to 3 percent.

Typical pedon of Leeray clay, 1 to 3 percent slopes; from the intersection of Farm Road 586 and U.S. Highway 64 in Bangs; about 2.0 miles south and west on Farm Road 586; 1.0 mile west on county road; 650 feet north on county road; and 50 feet east of county road in old cultivated field:

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; hard, firm, slightly sticky; few small pebbles of chert; calcareous; moderately alkaline; abrupt smooth boundary.

A11—6 to 26 inches; dark grayish brown (2.5Y 4/2) clay, very dark grayish brown (2.5Y 3/2) moist; moderate fine angular blocky structure; hard, very firm, slightly sticky; few intersecting slickensides in the lower part; few small pebbles of chert; darkened vertical streaks about 1/2 inch wide extend to a depth of 24 inches; calcareous; moderately alkaline; clear smooth boundary.

A12—26 to 48 inches; brown (10YR 4/3) clay, dark brown (10YR 3/3) moist; weak fine blocky structure; hard, very firm, slightly sticky; common grooved intersecting slickensides; few concretions and soft bodies of calcium carbonate; calcareous; moderately alkaline; gradual smooth boundary.

Cca—48 to 60 inches; brownish yellow (10YR 6/6) clay, yellowish brown (10YR 5/6) moist; massive; hard, very firm; calcareous; moderately alkaline.

Thickness of the solum ranges from 40 to 90 inches. When dry, these soils have cracks as much as 1 inch wide that extend from the surface to a depth of more than 20 inches. Intersecting slickensides begin at a depth of about 16 to 24 inches. Clay content ranges from about 40 to 60 percent throughout the control section.

The A horizon is grayish brown, dark grayish brown, very dark grayish brown, brown, dark brown, or very dark brown. Parts of some pedons have chroma of 1 in the bottom of the microdepressions, but these parts make up less than one-half of the pedon. In parts of some pedons, the A horizon is noncalcareous in the upper 12 inches of the microdepressions.

The AC horizon, where present, has value one or two units higher than the A horizon. It is silty clay or clay and is calcareous. Reaction is moderately alkaline. Calcium carbonate concretions or soft powdery forms range from few to many. A few rounded siliceous pebbles or limestone fragments are on the surface or within the A and AC horizons of some pedons.

The Cca horizon is brown, light brown, brownish yellow, pale brown, light olive brown, yellowish brown, or light yellowish brown. It is silty clay or clay. In some pedons, this horizon is underlain by shale or limestone.

Lindy series

The Lindy series consists of moderately deep, loamy upland soils that formed in clayey material weathered from limestone. Slopes are 1 to 3 percent.

Typical pedon of Lindy clay loam, 1 to 3 percent slopes; from the junction of Texas Highway 279 and Farm Road 1850 east of Grosvenor; about 1.5 miles north on Texas Highway 279; 1.4 miles east on county road; and 800 feet north of road in cultivated field:

Ap—0 to 6 inches; brown (7.5YR 4/4) clay loam, dark brown (7.5YR 3/4) moist; moderate fine subangular blocky structure; hard, firm; mildly alkaline; clear smooth boundary.
B21t—6 to 16 inches; reddish brown (5YR 4/4) clay, dark reddish brown (5YR 3/4) moist; moderate fine subangular blocky structure; very hard, very firm; continuous clay films on faces of peds; mildly alkaline; gradual smooth boundary.
B22t—16 to 28 inches; reddish brown (5YR 5/3) clay, reddish brown (5YR 4/3) moist; moderate fine subangular blocky structure; very hard, very firm; continuous clay films on faces of peds; mildly alkaline; abrupt smooth boundary.
R—28 inches; angular limestone fragments or flags with light reddish brown clay in the crevices in the upper part.

Thickness of the solum ranges from 20 to 40 inches over fractured limestone bedrock. Coarse fragment content ranges from 0 to 20 percent in the A horizon and 0 to 15 percent in the Bt horizon.

The A horizon is dark grayish brown, dark brown, brown, or reddish brown. Reaction is slightly acid to mildly alkaline. The Bt horizon is reddish brown, dark reddish brown, brown, red, or yellowish red. It is clay loam or clay with clay content ranging from 35 to 60 percent. Reaction ranges from slightly acid to mildly alkaline.

May series

The May series consists of deep, loamy upland soils. These soils formed in loamy sediment in shallow valleys. Slopes are 0 to 3 percent.

Typical pedon of May fine sandy loam, 0 to 1 percent slopes; from the junction of Farm Road 1689 and U.S. Highway 183 in May; about 6 miles north on U.S. Highway 183; 1.8 miles west and 0.6 mile north on county road; and 400 feet west in cultivated field:

Ap—0 to 6 inches; brown (10YR 5/3) fine sandy loam, brown (10YR 4/3) moist; weak fine granular structure; slightly hard, friable; neutral; clear smooth boundary.
A1—6 to 14 inches; brown (10YR 4/3) fine sandy loam, dark brown (10YR 3/3) moist; moderate fine granular structure; slightly hard, friable; neutral; clear smooth boundary.
B21t—14 to 30 inches; brown (7.5YR 4/4) sandy clay loam, dark brown (7.5YR 3/4) moist; moderate fine subangular blocky structure; hard, firm; clay films on faces of peds; neutral; clear smooth boundary.
B22t—30 to 48 inches; brown (10YR 5/3) sandy clay loam, brown (10YR 4/3) moist; moderate fine subangular blocky structure; very hard, firm; few black concretions; calcareous in the lower part; mildly alkaline; clear wavy boundary.
Cca—48 to 80 inches; light gray (10YR 7/2) sandy clay loam; light brownish gray (10YR 6/2) moist; massive; hard, firm; calcareous; moderately alkaline.

Thickness of the solum ranges from 40 to 70 inches. The A horizon is brown, grayish brown, dark grayish brown, dark yellowish brown, or yellowish brown. Some pedons have an Ap horizon that is light brownish gray or pale brown. Reaction is slightly acid to mildly alkaline.

The Bt horizon is brown, dark grayish brown, yellowish brown, or light yellowish brown. The B21t and B22t horizons are sandy clay loam or clay loam with clay content ranging from 20 to 35 percent. Reaction is neutral or mildly alkaline.

The Cca horizon is yellowish brown, light yellowish brown, very pale brown, light gray, or white. It is sandy clay loam, loam, or fine sandy loam. Reaction is mildly alkaline or moderately alkaline.

Menard series

The Menard series consists of deep, loamy upland soils that formed in calcareous, loamy sediment. Slopes are 1 to 8 percent.

Typical pedon of Menard fine sandy loam, 2 to 5 percent slopes, eroded; from the junction of Farm Road 1689 and U.S. Highway 183 in May; about 2.0 miles north on U.S. Highway 183; 0.7 mile east on county road; and 300 feet north in a cultivated field:

Ap—0 to 6 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 4/3) moist; weak granular structure; hard, friable; common fine roots; few very fine pores; neutral; abrupt smooth boundary.
B21t—6 to 18 inches; reddish brown (5YR 5/4) sandy clay loam, reddish brown (5YR 4/4) moist; weak blocky structure; very hard, firm, slightly sticky; few fine roots; common very fine pores; patchy clay films on faces of peds; neutral; clear smooth boundary.
B22t—18 to 29 inches; yellowish red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) moist; weak blocky structure; hard, firm, slightly sticky; few fine roots; common very fine pores; clay films on faces of peds; neutral; clear wavy boundary.
B3ca—29 to 36 inches; strong brown (7.5YR 5/6) sandy clay loam, strong brown (7.5YR 5/6) moist; weak blocky structure; hard, firm; common very fine pores; common films and threads of calcium carbonate increasing with depth; calcareous; moderately alkaline; clear wavy boundary.
Cca—36 to 60 inches; yellowish red (5YR 5/6) sandy clay loam; massive; common calcium carbonate concretions; common films, threads, and soft bodies of calcium carbonate; calcareous; moderately alkaline.

Thickness of the solum ranges from 30 to 50 inches. The A horizon is brown, grayish brown, light brownish

gray, light yellowish brown, or pale brown. The A horizon is neutral or mildly alkaline.

The B horizon is reddish brown, yellowish red, red, reddish yellow, brown, or strong brown. It is sandy clay loam or clay loam with a clay content of about 25 to 35 percent. Depth to the B3ca horizon ranges from 20 to 36 inches. Reaction is slightly acid to moderately alkaline.

The Cca horizon is sandy loam, sandy clay loam, or clay loam.

Mereta series

The Mereta series consists of shallow, loamy upland soils that formed in calcareous old alluvium or in chalky marine sediment. Slopes are 1 to 3 percent.

Typical pedon of Mereta clay loam, 1 to 3 percent slopes; from the intersection of Texas Highway 45 and Farm Road 2126 south of Brownwood, about 2.9 miles south on Texas Highway 45; and 75 feet east of highway in rangeland:

A11—0 to 10 inches; brown (7.5YR 4/2) clay loam, dark brown (7.5YR 3/2) moist; moderate very fine subangular blocky and fine granular structure; hard, firm; a few caliche fragments mainly less than 1 inch across; calcareous; moderately alkaline; gradual wavy boundary.

A12—10 to 18 inches; brown (7.5YR 4/3) clay loam, dark brown (7.5YR 3/3) moist; moderate very fine subangular blocky structure; hard, firm; about 10 percent by volume strongly cemented caliche fragments, mainly 2 to 8 inches across; calcareous; moderately alkaline; abrupt wavy boundary.

C1cam—18 to 31 inches; pink (7.5YR 8/4) strongly cemented caliche, pink (7.5YR 7/4) moist; massive; extremely hard; about 10 percent by volume reddish brown (5YR 5/4) silty clay loam and 10 percent weakly cemented masses of caliche in the crevices; calcareous; moderately alkaline; clear wavy boundary.

C2ca—31 to 46 inches; light red (2.5YR 6/6) loam, red (2.5YR 5/6) moist; massive; hard, friable; a few strongly cemented limestone or caliche fragments; calcareous; moderately alkaline.

Thickness of the solum ranges from 14 to 20 inches over strongly cemented caliche. Texture of the control section ranges from clay loam to clay with 35 to 45 percent clay. Coarse fragments in the control section range from few to about 10 percent, by volume. These soils are calcareous and are moderately alkaline throughout the profile.

The A horizon is brown, dark grayish brown, reddish brown, or dark reddish brown.

The C1cam is strongly cemented and is massive to platy. The C2ca horizon is limy marl. It is loam or clay loam and has a very high content of calcium carbonate.

Miller series

The Miller series consists of deep, clayey soils that formed in calcareous, alluvial sediment on flood plains. Slopes are 0 to 1 percent.

Typical pedon of Miller silty clay, occasionally flooded; from the intersection of Farm Road 574 and U.S. Highway 183 in Goldthwaite; about 9.5 miles west on Farm Road 574; 3.3 miles south and west on county road; 0.7 mile south on field road; and 300 feet east in a cultivated field:

Ap—0 to 5 inches; reddish brown (5YR 4/3) silty clay, dark reddish brown (5YR 3/3) moist; moderate very fine subangular blocky structure; hard, firm; common fine roots; calcareous; moderately alkaline; abrupt smooth boundary.

A1—5 to 17 inches; reddish brown (5YR 4/3) silty clay, dark reddish brown (5YR 3/3) moist; moderate fine blocky structure; very hard, firm; common fine roots; few fine pores; some peds have shiny faces; calcareous; moderately alkaline; gradual wavy boundary.

B2—17 to 48 inches; reddish brown (5YR 4/4) silty clay, dark reddish brown (5YR 3/4) moist, moderate fine and medium blocky structure; very hard, very firm; common shiny pressure faces; few nonintersecting pressure faces; few films, threads, and soft bodies of calcium carbonate; few fine roots; vertical streaks of dark material; calcareous; moderately alkaline; gradual wavy boundary.

C—48 to 80 inches; reddish brown (5YR 5/4) silty clay, reddish brown (5YR 4/4) moist; massive; very hard, firm; few pressure faces; few nonintersecting slickensides; about 3 percent fine and very fine calcium carbonate concretions; common films and threads of calcium carbonate; calcareous; moderately alkaline.

Thickness of the solum ranges from 30 to 60 inches or more. The soil is calcareous and moderately alkaline, and soft powdery lime is within a depth of 30 inches. Cracks more than 1 centimeter wide extend from the surface to a depth of about 30 inches during some seasons in most years. Slickensides range from few to common but do not intersect.

The A horizon is reddish gray, dark reddish gray, reddish brown, or brown.

The B2 horizon is red, reddish brown, dark reddish brown, yellowish red, brown, or strong brown. It is clay, silty clay, or silty clay loam. Clay content is 35 to 60 percent and COLE exceeds 0.07.

Nimrod series

The Nimrod series consists of deep, sandy upland soils that formed in thick beds of sandy and loamy materials. Slopes are 0 to 5 percent.

Typical pedon of Nimrod fine sand, 0 to 5 percent slopes; from the junction of Texas Highway 279 and

Farm Road 2940 in Cross Cut; about 3.5 miles north on Texas Highway 279 to Callahan County line and intersection with county road; 3 miles east and south on county road; and 90 feet north in wooded pasture:

A1—0 to 10 inches; pale brown (10YR 6/3) fine sand, brown (10YR 5/3) moist; single grain; loose, very friable; slightly acid; abrupt smooth boundary.
A2—10 to 30 inches; very pale brown (10YR 7/3) fine sand, pale brown (10YR 6/3) moist; single grain; loose, very friable; slightly acid; abrupt smooth boundary.
B21t—30 to 46 inches; light gray (10YR 7/2) sandy clay loam, light brownish gray (10YR 6/2) moist; many coarse mottles of red (2.5YR 4/6) and strong brown (7.5YR 5/6); moderate fine subangular blocky structure; hard, firm; patchy clay films on faces of peds; medium acid; abrupt wavy boundary.
B22t—46 to 66 inches; brownish yellow (10YR 6/6) sandy clay loam, yellowish brown (10YR 5/6) moist; common coarse mottles of red (2.5YR 4/6) and light brownish gray (10YR 6/2); moderate fine subangular blocky structure; hard, firm; few sandstone fragments; medium acid; abrupt wavy boundary.
C—66 to 80 inches; light brownish gray (10YR 6/2) fine sandy loam, grayish brown (10YR 5/2) moist; common coarse red (2.5YR 4/6) mottles; massive; hard, firm; few sandstone fragments; medium acid.

Thickness of the solum ranges from 60 to 80 inches. Thickness of the A horizon ranges from 20 to 40 inches. The A1 horizon is light gray, light brown, brown, grayish brown, dark grayish brown, yellowish brown, pale brown, or light yellowish brown. The A2 horizon is pale brown, very pale brown, or light yellowish brown. Reaction is medium acid to neutral in the A horizon.

The B2t horizon is light gray, reddish yellow, yellowish brown, or brownish yellow and mottled in shades of brown, red, yellow, or gray. The upper 20 inches of the B2t horizon is dominantly sandy clay loam, and reaction is strongly acid or medium acid.

The C horizon ranges from mottled, light brownish gray sandy clay loam or sandy loam to little-altered packsands. Reaction is strongly acid to slightly acid.

Nukrum series

The Nukrum series consists of deep, clayey upland soils that formed in calcareous, clayey outwash sediment. Slopes are 1 to 4 percent.

Typical pedon of Nukrum silty clay, 1 to 3 percent slopes; from the Brown County Courthouse about 2.5 miles south on U.S. Highway 377; 0.7 mile southwest on Chapel Hill Road; and 600 feet south of the road in a cultivated field:

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) silty clay, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; hard, firm, slightly sticky; common roots; calcareous; moderately alkaline; abrupt smooth boundary.
A1—6 to 24 inches; dark grayish brown (10YR 4/2) silty clay, very dark grayish brown (10YR 3/2) moist; moderate fine and medium subangular blocky structure; hard, firm, slightly sticky; evidence of cracks extends to a depth of more than 20 inches; common roots; calcareous; moderately alkaline; gradual wavy boundary.
B2—24 to 56 inches; grayish brown (10YR 5/2) silty clay, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure; hard, firm, slightly sticky; few roots; few films, threads, and soft bodies of calcium carbonate; calcareous; moderately alkaline; gradual wavy boundary.
Cca—56 to 72 inches; brown (10YR 5/3) silty clay loam, dark brown (10YR 4/3) moist; massive; hard, firm, slightly sticky; about 2 percent by volume concretions and soft bodies of calcium carbonate; calcareous; moderately alkaline.

Thickness of the solum ranges from 42 to 72 inches. When dry, these soils have cracks of 0.4 inch to 1.2 inches wide that extend from the surface to a depth of more than 20 inches.

The A horizon is very dark grayish brown, dark grayish brown, dark brown, brown, reddish brown, or dark reddish gray. Thickness of the horizon that has moist value and chroma of less than 3.5 is 20 to 58 inches.

The B horizon, where present, is brown, grayish brown, yellowish brown, brownish yellow, or reddish brown. Visible concretions and powdery bodies of calcium carbonate range from less than 1 percent to about 10 percent, by volume. Depth to visible carbonates ranges from 10 to 26 inches. The B horizon is silty clay, clay, or clay loam and is calcareous. Reaction is moderately alkaline.

The Cca horizon is light brownish gray, brown, pale brown, yellow, reddish yellow, reddish brown, or pale red. It is silty clay loam, silty clay, or clay loam. Some pedons are underlain by shaly clay. Secondary calcium carbonate content ranges from 2 to 20 percent, by volume.

Nuvalde series

The Nuvalde series consists of deep, loamy upland soils. These soils formed in thick beds of calcareous, loamy outwash deposits. Slopes are 1 to 3 percent.

Typical pedon of Nuvalde clay loam, 1 to 3 percent slopes; from the intersection of Farm Road 1176 and U.S. Highway 377 southwest of Brownwood; about 4.3 miles west on Farm Road 1176; 1.6 miles west and north, 1.6 miles west, and 1.3 miles north and east on county road; and 100 feet south in a cultivated field:

Ap—0 to 10 inches; brown (10YR 4/3) clay loam, dark brown (10YR 3/3) moist; moderate angular blocky

structure; hard, friable; common fine roots; few very fine siliceous pebbles; calcareous; moderately alkaline; clear wavy boundary.

B21—10 to 18 inches; brown (10YR 5/3) clay loam, brown (10YR 4/3) moist; moderate fine subangular blocky structure; hard, firm; few rounded siliceous pebbles; calcareous; moderately alkaline; clear wavy boundary.

B22ca—18 to 32 inches; brown (10YR 5/3) clay loam, brown (10YR 4/3) moist; moderate fine subangular blocky structure; hard, firm; few siliceous pebbles; common films and soft bodies of calcium carbonate; calcareous; moderately alkaline; abrupt wavy boundary.

Cca—32 to 60 inches; pink (7.5YR 7/4) clay loam, light brown (7.5YR 6/4) moist; massive; hard, friable; many soft bodies and concretions of calcium carbonate; calcium carbonate equivalent is more than 40 percent; calcareous; moderately alkaline.

Thickness of the solum ranges from 20 to 40 inches. The A horizon is dark grayish brown, grayish brown, or brown.

The B2 horizon is brown, pale brown, reddish brown, or light brown. It is clay loam, silty clay loam, or silty clay. The amount of visible carbonates in the form of concretions and films and threads ranges from less than 1 percent, by volume, in the upper part to as much as 10 percent in the lower part.

The Cca horizon ranges from pink to white and has a calcium carbonate equivalent of about 40 to 70 percent. It is clay loam, silty clay loam, or silty clay; and reaction is moderately alkaline.

Patilo series

The Patilo series consists of deep, sandy upland soils. These soils formed in thick beds of sandy material. Slopes are 1 to 5 percent.

Typical pedon of Patilo fine sand, 1 to 5 percent slopes; from the junction of U.S. Highway 183 and Farm Road 583 north of May; about 3.0 miles west on Farm Road 583, 2.4 miles north, 1.3 miles west, and 1.6 miles north on county road; and 200 feet east on a farm trail in brushy rangeland:

A1—0 to 8 inches; brown (10YR 5/3) fine sand, dark brown (10YR 4/3) moist; single grain; loose; common roots; neutral; clear smooth boundary.

A2—8 to 48 inches; very pale brown (10YR 8/3) fine sand, very pale brown (10YR 7/3) moist; single grain; loose; slightly acid; clear wavy boundary.

B2t—48 to 68 inches; mottled red (2.5YR 4/8) and light gray (10YR 7/2) sandy clay loam; weak coarse subangular blocky structure; very hard, firm; patchy clay films on ped surfaces and on sand grains; slightly acid.

Thickness of the solum ranges from 65 to 100 inches or more. The A horizon is neutral to medium acid. The A1 horizon is dark grayish brown, dark brown, grayish brown, brown, light brownish gray, pale brown, very pale brown, light yellowish brown, or yellowish brown. The A2 horizon is brown, very pale brown, light gray, white, light yellowish brown, or reddish yellow.

The B2t horizon is light gray, white, very pale brown, pale brown, light yellowish brown, brownish yellow, reddish yellow, yellowish red, or yellow with varying sizes and amounts of red, dark red, yellow, and gray mottles. It is dominantly sandy clay loam, and reaction is slightly acid to strongly acid.

Pedernales series

The Pedernales series consists of deep, loamy upland soils. These soils formed in thick beds of calcareous, clayey and loamy materials. Slopes are 1 to 5 percent.

Typical pedon of Pedernales fine sandy loam, 1 to 3 percent slopes; from the intersection of U.S. Highway 183 and a county road at Owens; about 0.8 mile northeast and 0.95 mile east on county road; and 100 feet north of county road right-of-way in wooded rangeland:

A1—0 to 14 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 4/3) moist; weak fine granular structure; hard, friable; common roots; neutral; clear smooth boundary.

B21t—14 to 29 inches; reddish brown (5YR 5/4) sandy clay, reddish brown (5YR 4/4) moist; moderate medium blocky structure; very hard, very firm; continuous clay films on faces of peds; mildly alkaline; gradual smooth boundary.

B22t—29 to 37 inches; reddish brown (5YR 5/4) clay, reddish brown (5YR 4/4) moist; weak medium blocky structure; very hard, very firm; clay films on faces of peds; few concretions and soft bodies of calcium carbonate increasing with depth; calcareous; moderately alkaline; gradual smooth boundary.

Cca—37 to 60 inches; reddish yellow (7.5YR 6/6) sandy clay loam, strong brown (7.5YR 5/6) moist; massive; hard, firm; common small concretions and soft bodies of calcium carbonate; calcareous; moderately alkaline.

Thickness of the solum ranges from 35 to 60 inches. Secondary carbonates are at a depth of 28 to 50 inches.

The A horizon is fine sandy loam or loamy fine sand. It is reddish brown, yellowish red, brown, light brown, pale brown, or light yellowish brown. Reaction is slightly acid to mildly alkaline.

The B21t and B22t horizons are red, reddish brown, or reddish yellow. Some pedons have yellowish and brownish mottles in the lower part of the Bt horizon. Texture is sandy clay or clay, and reaction is slightly acid to mildly alkaline. In the lower part of some pedons, reaction is moderately alkaline. In some pedons a B3ca horizon is present and is sandy clay loam, clay loam, or sandy clay.

The Cca horizon is sandy clay loam or sandy clay that, in some places, contains thin strata of soft limestone or calcareous sandstone. The Cca horizon is pinkish gray, light red, light reddish brown, pink, light brown, reddish brown, or reddish yellow. Calcium carbonate concretions and soft powdery forms in the C horizon range from 5 to 30 percent, by volume, and do not decrease as depth increases.

Real series

The Real series consists of shallow, gravelly, loamy soils that formed in material weathered from limestone. Slopes are 1 to 30 percent.

Typical pedon of Real gravelly clay loam, in an area of Real-Tarrant association, hilly; from the intersection of U.S. Highway 183 and Texas Highway 16 in Goldthwaite; about 1.1 miles south on U.S. Highway 183 to electrical power transmission line; about 2,800 feet southeast on the utility line right-of-way; and 150 feet north in rangeland:

A11—0 to 5 inches; very dark grayish brown (10YR 3/2) gravelly clay loam, very dark brown (10YR 2/2) moist; moderate very fine subangular blocky and fine granular structure; hard, firm; about 60 percent of surface covered by limestone fragments, mainly 1 inch to 3 inches wide, and a few cobbles and stones; about 35 percent by volume weakly cemented limestone fragments that have thin coatings and pendants of secondary calcium carbonate; calcareous; moderately alkaline; clear smooth boundary.

A12ca—5 to 11 inches; dark grayish brown (10YR 4/2) very gravelly clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine subangular blocky and fine granular structure; hard, firm; about 70 percent by volume weakly cemented limestone fragments less than 3 inches wide; few cobble size limestone fragments that contain thin coatings and pendants of secondary calcium carbonate on the lower surface; calcareous; moderately alkaline; abrupt smooth boundary.

Cr&Cca—11 to 24 inches; pale yellow (5Y 7/3) weakly cemented limestone with the upper 1 inch to 2 inches slightly harder than the material below; thin seams of calcareous sandy clay loam in fractures and between limestone layers.

Thickness of the solum ranges from 8 to 20 inches and corresponds to the depth to a paralithic contact of weakly cemented limestone. Limestone fragments, mainly from 0.2 inch to 3 inches across, make up 35 to 85 percent of the solum.

The calcium carbonate equivalent of the A horizon ranges from 40 to 60 percent or more. The A horizon is very dark gray, dark gray, grayish brown, dark grayish brown, very dark grayish brown, brown, or dark brown. It ranges from gravelly clay loam to very gravelly loam.

Rochelle series

The Rochelle series consists of deep, loamy upland soils. These soils formed in loamy material over gravel beds. Slopes are 1 to 5 percent.

Typical pedon of Rochelle fine sandy loam, 1 to 5 percent slopes; from the intersection of U.S. Highway 183 and U.S. Highway 77 in Early; about 1.4 miles north on U.S. Highway 183; 0.4 mile east on county road to the Staley Cemetery; and 30 feet south of cemetery near gravel pit:

A1—0 to 8 inches; reddish brown (5YR 4/4) fine sandy loam, dark reddish brown (5YR 3/4) moist; moderate fine subangular blocky structure; hard, friable; about 5 percent by volume siliceous pebbles and limestone fragments; common roots; neutral; clear smooth boundary.

B21t—8 to 18 inches; reddish brown (5YR 4/4) sandy clay loam, dark reddish brown (5YR 3/4) moist; moderate fine and medium subangular blocky structure; hard, friable; about 5 percent by volume siliceous pebbles; patchy clay films on faces of peds; common roots; neutral; gradual wavy boundary.

B22t—18 to 32 inches; reddish brown (2.5YR 4/4) gravelly sandy clay loam, dark reddish brown (2.5YR 3/4) moist; hard, firm; about 25 percent by volume caliche-coated limestone fragments less than 3 inches across and common siliceous pebbles; calcareous; moderately alkaline; clear wavy boundary.

Cca—32 to 60 inches; strong brown (7.5YR 5/6) very gravelly sandy loam, strong brown (7.5YR 4/6) moist; massive; hard, friable; more than 60 percent by volume rounded limestone and siliceous fragments less than 3 inches across and 5 percent by weight fragments 3 to 10 inches across; some fragments are cemented with calcium carbonate; few films and soft bodies of calcium carbonate; calcareous; moderately alkaline.

Thickness of the solum ranges from 20 to 54 inches. Coarse fragments consisting of waterworn siliceous pebbles and limestone pebbles range from 15 to 35 percent in the upper 20 inches of the Bt horizon, but the lower part of the Bt horizon may contain 60 percent or more coarse fragments. Secondary carbonates are within a depth of 36 inches.

The A horizon is reddish brown, yellowish brown, dark yellowish brown, or brown. Reaction is neutral or mildly alkaline.

The Bt horizon is brown, reddish brown, yellowish red, or red. It is dominantly sandy clay loam in the upper part and sandy clay loam, gravelly clay loam, sandy clay, or gravelly sandy clay loam in the lower part. Coarse fragments range from 5 to 35 percent in the upper 20 inches of the argillic horizon and increase in size and number with depth. Clay content may exceed 35 percent in the lower part of the Bt horizon, but the average clay con-

tent in the upper 20 inches ranges from 24 to 35 percent. Reaction is neutral or mildly alkaline, and some pedons are moderately alkaline in the lower part.

The Cca horizon ranges from very gravelly sand to very gravelly fine sandy loam.

Rowena series

The Rowena series consists of deep, loamy upland soils that formed in calcareous clay loam and clay sediments. Slopes are 0 to 3 percent.

Typical pedon of Rowena clay loam, 1 to 3 percent slopes; from the intersection of U.S. Highway 183 and Texas Highway 16 in Goldthwaite; about 12.1 miles south on U.S. Highway 183; 0.9 mile west, south, and west on county road; and 250 feet south in native pasture:

A1—0 to 8 inches; very dark grayish brown (10YR 3/2) clay loam, very dark brown (10YR 2/2) moist; moderate fine subangular blocky structure; hard, firm, slightly sticky; common fine roots; cracks extend through horizon; calcareous; moderately alkaline; clear smooth boundary.

B21—8 to 22 inches; dark brown (7.5YR 3/2) clay loam, very dark brown (7.5YR 2/2) moist; moderate fine subangular blocky structure; hard, firm, slightly sticky; common fine roots; cracks extend below a depth of 20 inches; calcareous; moderately alkaline; clear smooth boundary.

B22—22 to 42 inches; dark brown (7.5YR 4/2) clay loam, dark brown (7.5YR 3/2) moist; weak fine subangular blocky structure; hard, firm; common fine and medium soft bodies of calcium carbonate; calcareous; moderately alkaline; abrupt smooth boundary.

Cca—42 to 80 inches; pink (7.5YR 7/4) silty clay loam, light brown (7.5YR 6/4) moist; massive; slightly hard, friable, slightly sticky; 50 percent by volume soft bodies and strongly cemented concretions of calcium carbonate; calcareous; moderately alkaline.

Thickness of the solum ranges from 22 to 48 inches. The COLE exceeds 0.07. When the soil is dry, cracks that are 1 centimeter to 3 centimeters wide extend from the surface to a depth of 20 to 30 inches.

The A and B21 horizons are grayish brown, brown, dark grayish brown, very dark grayish brown, or dark brown. The B22 horizon is grayish brown, dark grayish brown, brown, dark brown, or reddish brown. The B21 and B22 horizons are clay loam or clay.

The Cca horizon is pink, light reddish brown, light brown, yellow, reddish yellow, or yellowish red. It is silty clay loam, clay loam, or clay. Calcium carbonate equivalent of the Cca horizon is 20 to 60 percent.

Sagerton series

The Sagerton series consists of deep, loamy upland soils that formed in calcareous, clayey sediment. Slopes are 0 to 3 percent.

Typical pedon of Sagerton clay loam, 0 to 1 percent slopes; from the junction of U.S. Highway 67 (also U.S. Highway 84) and Farm Road 585 west of Bangs; about 1.0 mile west on U.S. Highway 67; 2.3 miles south on county road; and 750 feet west in a cultivated field:

Ap—0 to 6 inches; dark brown (7.5YR 4/2) clay loam, dark brown (7.5YR 3/2) moist; moderate very fine subangular blocky and granular structure; hard, firm; neutral; abrupt smooth boundary.

B21t—6 to 12 inches; reddish brown (5YR 4/3) clay, dark reddish brown (5YR 3/3) moist; moderate medium subangular blocky structure; very hard, firm; clay films on faces of peds; mildly alkaline; gradual smooth boundary.

B22t—12 to 27 inches; reddish brown (5YR 4/4) clay, reddish brown (5YR 4/3) moist; weak medium prismatic structure parting to moderate medium blocky; very hard, firm; continuous clay films with slightly darker color on faces of peds; mildly alkaline; clear smooth boundary.

B23tca—27 to 39 inches; brown (7.5YR 5/4) clay, brown (7.5YR 4/4) moist; moderate fine subangular blocky structure; very hard, firm; patchy clay films; few calcium carbonate concretions up to 1 inch across; about 30 percent pockets of very pale brown, segregated calcium carbonate; few krotovinas; few worm casts; calcareous; moderately alkaline; gradual smooth boundary.

B24tca—39 to 80 inches; reddish yellow (7.5YR 6/6) clay loam, strong brown (7.5YR 5/6) moist; weak very fine subangular blocky structure; very hard, firm; about 35 percent pale brown segregated calcium carbonate, decreasing to about 10 percent in the lower 8 inches; few concretions up to about 1 inch across; few krotovinas in the upper 6 inches; calcareous; moderately alkaline.

Thickness of the solum ranges from 60 to 80 inches or more. Depth to secondary carbonates ranges from 20 to 28 inches. A distinct calcic horizon is at a depth of 30 to 60 inches.

The A horizon is reddish brown, reddish gray, dark reddish gray, dark brown, brown, or grayish brown. Reaction is neutral or mildly alkaline.

The Bt horizon is clay or clay loam throughout. The average clay content in the upper 20 inches of the Bt horizon ranges from about 35 to 45 percent. The B21t horizon is similar in color to the A horizon. The B22t and B23t horizons are light reddish brown, reddish brown, red, reddish yellow, yellowish red, or brown. The calcic horizon is estimated to have a calcium carbonate equivalent of 20 to 50 percent. The calcium carbonate is mainly

in the form of soft bodies and concretions. The Bt horizon is neutral to moderately alkaline.

Speck series

The Speck series consists of shallow, loamy upland soils that formed in clayey material over limestone. Slopes are 1 to 5 percent.

Typical pedon of Speck stony clay loam, in an area of Speck-Tarrant association, gently undulating; from the intersection of Texas Highway 279 and Farm Road 2632 northwest of Brownwood; about 2.1 miles north on Farm Road 2632; 0.3 mile north on county road; and 100 feet east in rangeland:

A1—0 to 7 inches; brown (10YR 4/3) stony clay loam, dark brown (10YR 3/3) moist; moderate fine subangular blocky structure; hard, firm; common fine roots; about 20 percent of surface covered with limestone flags; few fine siliceous pebbles; neutral; clear smooth boundary.

B2t—7 to 15 inches; reddish brown (5YR 4/3) clay, dark reddish brown (5YR 3/3) moist; moderate fine subangular blocky structure; hard, firm; few fine roots; patchy clay films on surfaces of peds; few siliceous pebbles; few limestone fragments less than 3 inches across; neutral; abrupt smooth boundary.

R—15 inches; very pale brown, very hard limestone bedrock.

Thickness of the solum over limestone bedrock ranges from 14 to 20 inches. Coarse fragments range from few to 25 percent on the surface and in the soil. Cobbles and stones are mainly limestone, and pebbles are mainly angular chert.

The A horizon is dark grayish brown, reddish brown, or brown. Reaction is slightly acid to mildly alkaline.

The B2t horizon is reddish brown, dark reddish brown, or brown. Clay content ranges from 40 to about 60 percent. Reaction is slightly acid to mildly alkaline.

Sunev series

The Sunev series consists of deep, loamy upland soils that formed in ancient alluvium. Slopes are 1 to 3 percent.

Typical pedon of Sunev clay loam, 1 to 3 percent slopes; from the intersection of U.S. Highway 84 and Farm Road 2005 east of Goldthwaite; about 5.6 miles north and east on Farm Road 2005; 2.8 miles south and east on county road; and south of road in right-of-way road cut (about 200 feet west of the North Bennett Creek crossing):

A11—0 to 10 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; hard, firm, slightly sticky; many fine roots; few limestone fragments up to 4 millimeters across; calcareous; moderately alkaline; gradual smooth boundary.

A12—10 to 18 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium granular structure; hard, firm, slightly sticky; common fine roots; few limestone fragments up to 6 millimeters across; calcareous; moderately alkaline; gradual smooth boundary.

B2ca—18 to 32 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; weak fine granular structure; slightly hard, friable; few fine roots; common specks of lime less than 2 millimeters in diameter and few fragments up to 6 millimeters across; common hard lumps and soft bodies of calcium carbonate; 60 percent calcium carbonate equivalent; calcareous; moderately alkaline; clear smooth boundary.

C1ca—32 to 48 inches; very pale brown (10YR 7/4) loam, light yellowish brown (10YR 6/4) moist; massive; slightly hard, friable; common soft bodies of calcium carbonate; few concretions; 65 percent calcium carbonate equivalent; calcareous; moderately alkaline; gradual smooth boundary.

C2ca—48 to 80 inches; yellow (10YR 7/6) loam, brownish yellow (10YR 6/6) moist; massive; slightly hard, friable; common soft bodies and few concretions of calcium carbonate; 65 percent calcium carbonate equivalent; calcareous; moderately alkaline.

Calcium carbonate equivalent between depths of 10 and 40 inches is 40 to 70 percent. These soils are calcareous and moderately alkaline throughout.

The A horizon is dark grayish brown, dark brown, grayish brown, or brown.

The Bca horizon is brown, pale brown, very pale brown, yellowish brown, reddish yellow, or light yellowish brown. It is loam, clay loam, or silty clay loam.

The C horizon is very pale brown, yellow, or reddish yellow loam, clay loam, or silty clay loam. Fine fragments of snail shells are in all horizons. Films and threads of calcium carbonate are evident in all horizons, and the amount increases as depth increases.

Tarpley series

The Tarpley series consists of shallow, loamy upland soils that formed in a thin mantle of clay over limestone. Slopes are 1 to 8 percent.

Typical pedon of Tarpley stony clay loam, in an area of Tarpley-Tarrant association, gently undulating; from the Mills County Courthouse in Goldthwaite; about 14.5 miles southeast on Farm Road 572; 1.4 miles north on an unpaved road to a private trail; 600 feet east to the top of a flat mountain; and 1,200 feet southeast on the plateau in rangeland:

A1—0 to 7 inches; very dark grayish brown (10YR 3/2) stony clay loam, very dark brown (10YR 2/2) moist;

moderate medium and fine blocky structure; very hard, firm, slightly sticky; common very fine and fine roots; few very fine pores; 15 percent by volume chert and limestone fragments; few chert stones on the surface; vertical cracks 1/2 to 1 inch wide throughout the horizon; neutral; clear smooth boundary.

B2t—7 to 18 inches; reddish brown (5YR 4/4) clay, dark reddish brown (5YR 3/4) moist; strong medium subangular blocky and blocky structure; extremely hard, very firm, very sticky; common very fine and fine roots; few very fine pores; clay films on faces of peds; few chert fragments mainly less than 5 millimeters across; vertical cracks extend to bedrock; neutral; abrupt smooth boundary.

R—18 inches; pale yellow, coarse grain, hard limestone bedrock.

Thickness of the solum ranges from 13 to 20 inches and corresponds to the depth of limestone bedrock. Reaction is slightly acid to mildly alkaline. Coarse fragments range from few to about 30 percent on the surface and in the soil. Cobbles and stones are limestone or chert.

The A horizon is very dark brown, very dark grayish brown, dark brown, or dark reddish brown.

The B2t horizon is dark brown, reddish brown, dark reddish brown, or dark reddish gray. The B2t horizon is clay or cobbly clay. Clay content ranges from 60 to 80 percent.

Tarrant series

The Tarrant series consists of very shallow to shallow, clayey upland soils that formed over fractured limestone bedrock. Slopes are 1 to 30 percent.

Typical pedon of Tarrant cobbly clay, in an area of Speck-Tarrant association, gently undulating; from the intersection of Texas Highway 279 and Farm Road 2632; about 2.1 miles north on Texas Highway 279; 1.3 miles north on paved road; and 100 feet east of road in rangeland:

A11—0 to 8 inches; very dark grayish brown (10YR 3/2) cobbly clay, very dark brown (10YR 2/2) moist; moderate fine angular blocky structure; hard, firm; common fine roots; about 20 percent limestone cobbles on the surface; few limestone fragments in the soil; calcareous; moderately alkaline; clear smooth boundary.

A12—8 to 15 inches; dark grayish brown (10YR 4/2) cobbly clay, very dark grayish brown (10YR 3/2) moist; moderate fine angular blocky structure; hard, firm; few fine roots; about 70 percent by volume limestone fragments; calcareous; moderately alkaline; abrupt smooth boundary.

R—15 inches; light brownish gray, very hard limestone bedrock.

Thickness of the solum ranges from 6 to 20 inches and corresponds to the depth of indurated limestone. The solum contains 35 to 85 percent coarse fragments. Coarse fragments are limestone or chert, and they are mainly more than 3 inches across.

The A horizon is dark brown, dark grayish brown, very dark grayish brown, or very dark brown. Clay content ranges from 40 to 60 percent.

Throck series

The Throck series consists of deep, loamy upland soils that formed in calcareous, shaly clay and clayey marl. Slopes are 1 to 30 percent.

Typical pedon of Throck stony clay loam, in an area of Throck association, hilly; from the intersection of Farm Road 2524 and Farm Road 2126 southeast of Brownwood; about 1.3 miles northeast on Farm Road 2126; and 125 feet west of road in rangeland:

A1—0 to 8 inches; grayish brown (10YR 5/2) stony clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine and very fine blocky structure; hard, firm; common roots; about 10 percent by volume gravel size limestone fragments; few limestone fragments 3 to 15 inches across on surface; calcareous; moderately alkaline; clear smooth boundary.

B2ca—8 to 32 inches; light yellowish brown (10YR 6/4) clay, yellowish brown (10YR 5/4) moist; moderate medium and fine blocky structure; hard, firm; about 5 percent by volume pebbles and small fossil fragments; few soft bodies and concretions of calcium carbonate; calcareous; moderately alkaline; gradual wavy boundary.

C—32 to 60 inches; light yellowish brown (2.5Y 6/4) shaly clay; massive; about 40 percent has platy rock structure.

Thickness of the solum ranges from 21 to 50 inches. Clay content of the control section ranges from 35 to 45 percent. Most pedons are calcareous and are moderately alkaline throughout.

The A horizon is dark grayish brown, grayish brown, or brown. In most pedons, limestone fragments that are 1 inch to 20 inches across make up about 1 to 15 percent, by volume.

The B2 horizon, where present, is dark yellowish brown, yellowish brown, brown, light yellowish brown, or light olive brown. Texture is silty clay loam, clay loam, silty clay, or clay. Limestone fragments vary from 5 to 30 percent, by volume. The B2ca horizon is reddish yellow, strong brown, very pale brown, pale yellow, or light yellowish brown. It is silty clay, gravelly clay, or gravelly silty clay. Content of calcium carbonate is 15 to 40 percent.

The C horizon is light yellowish brown, olive, or bluish gray shaly clay, clay, or silty clay loam. Interbedded limestone strata, 2 to 24 inches thick, are in most pedons at a depth of 40 to 80 inches.

Weswood series

The Weswood series consists of deep, loamy soils on flood plains. These soils formed in calcareous, loamy alluvium. Slopes are 0 to 1 percent.

Typical pedon of Weswood silt loam, occasionally flooded; from the intersection of U.S. Highway 183 and Texas Highway 16 in Goldthwaite; about 6.8 miles southwest on Texas Highway 16; 1.8 miles east and south on county road to ranch house; and 900 feet west of house in pastureland:

Ap—0 to 8 inches; reddish brown (5YR 4/4) silt loam, dark reddish brown (5YR 3/4) moist; weak fine granular structure; slightly hard, friable; common fine and medium roots; common fine pores; calcareous; moderately alkaline; abrupt smooth boundary.

B21—8 to 16 inches; reddish brown (5YR 5/4) silt loam, reddish brown (5YR 4/4) moist; weak medium subangular blocky structure; slightly hard, friable; common fine roots; many fine pores; few films and threads of calcium carbonate; calcareous; moderately alkaline; clear smooth boundary.

B22—16 to 30 inches; reddish brown (5YR 5/4) silt loam, reddish brown (5YR 4/4) moist; weak medium subangular blocky structure; slightly hard, friable; few fine roots; many fine pores; common films and threads of calcium carbonate; calcareous; moderately alkaline; clear smooth boundary.

B23—30 to 42 inches; reddish brown (5YR 5/4) silt loam, dark reddish brown (5YR 3/4) moist; weak fine subangular blocky structure; slightly hard, friable; common films and threads of calcium carbonate; remnants of thin bedding planes; calcareous; moderately alkaline; gradual smooth boundary.

C—42 to 80 inches; reddish yellow (5YR 6/6) silt loam, yellowish red (5YR 4/6) moist; massive; slightly hard, friable; common thin stratifications of fine sandy loam and silty clay loam; weak platy fragments in bedding planes; calcareous; moderately alkaline.

Thickness of the solum ranges from 28 to 50 inches. Texture between depths of 10 and 40 inches ranges from silt loam to silty clay loam with 20 to 35 percent clay. Thin stratifications of very fine sandy loam, clay loam, and clay are common below a depth of 20 inches. These soils are calcareous and moderately alkaline throughout.

The A horizon is reddish brown or brown. Where the A horizon has moist colors of 3.5 or less, it is less than 10 inches thick.

The B horizon is reddish brown or brown. It is silty clay loam or silt loam. The C horizon is yellowish red, reddish brown, reddish yellow, strong brown, or brown.

Winters series

The Winters series consists of deep, loamy upland soils that formed in old alluvial sediment. Slopes are 0 to 5 percent.

Typical pedon of Winters fine sandy loam, 1 to 3 percent slopes; from the intersection of Farm Road 2126, Farm Road 2524, and a county road southeast of Brownwood; about 4.0 miles southeast, 1.9 miles northeast, and 0.8 mile southeast on county road; 0.4 mile southwest and southeast on private road to ranch house; and 200 feet north of house in lovegrass pasture:

Ap—0 to 6 inches; reddish brown (5YR 5/4) fine sandy loam, reddish brown (5YR 4/4) moist; weak fine blocky structure; hard, friable; common fine roots; neutral; clear smooth boundary.

B21t—6 to 10 inches; reddish brown (2.5YR 4/4) clay loam, dark reddish brown (2.5YR 3/4) moist; moderate medium blocky structure; very hard, firm; common clay films on faces of peds; neutral; gradual smooth boundary.

B22t—10 to 36 inches; reddish brown (2.5YR 4/4) clay, dark reddish brown (2.5YR 3/4) moist; moderate medium blocky structure; very hard, firm; common clay films on faces of peds; moderately alkaline; clear smooth boundary.

B23t—36 to 48 inches; yellowish red (5YR 5/6) clay loam, yellowish red (5YR 4/6) moist; weak fine blocky structure; hard, firm; few films and threads of calcium carbonate; calcareous; moderately alkaline; clear smooth boundary.

B24tca—48 to 65 inches; reddish yellow (5YR 6/6) clay loam, yellowish red (5YR 5/6) moist; weak fine blocky structure; hard, firm; about 20 percent calcium carbonate as films, threads, and soft bodies; calcareous; moderately alkaline; clear smooth boundary.

Cca—65 to 80 inches; yellowish red (5YR 5/8) clay loam, yellowish red (5YR 4/8) moist; massive; slightly hard, friable; calcareous; moderately alkaline.

Thickness of the solum is more than 60 inches. Depth to carbonates is 30 to 50 inches. Depth to a calcic horizon is more than 40 inches, and some pedons do not have a calcic horizon within a depth of 80 inches.

The A horizon is reddish brown or brown. It is slightly acid to mildly alkaline.

The B2t horizon above the calcic horizon is reddish brown, dark reddish brown, red, or yellowish red. It is sandy clay, clay loam, or clay. Reaction is neutral to moderately alkaline. The Btca horizon is light reddish brown, reddish brown, or reddish yellow. It is clay loam, sandy clay loam, or clay. The calcium carbonate equivalent is 10 to 35 percent. Visible forms are mainly in soft powdery bodies and concretions.

Classification of the soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*7*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. In table 19, the soils of the survey area are classified according to the system. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Mollisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Ustoll (*Ust*, meaning dry, plus *oll*, from Mollisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Calciustolls (*Calci*, meaning calcareous, plus *ustoll*, the suborder of the Mollisols that have a dry moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Calciustolls.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, carbonatic, thermic Typic Calciustolls.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

Formation of the soils

Soil is a natural, three-dimensional body on the earth's surface that supports plants and has properties. Properties of the soil result from the integrated effect of climate and living matter acting on parent material, as conditioned by relief over periods of time.

The interaction of five main factors results in differences among the soils. These factors are the physical and chemical composition of the parent material, the climate during and after the accumulation of the parent material, the kind of plants and organisms living in the soils, the relief of the land and its effect on runoff, and the length of time it took the soil to form.

The effect of a factor can differ from place to place, but the interaction of all the factors determines the kind of soil that forms. In the following paragraphs the factors of soil formation are discussed as they relate to the soils in the survey area.

Climate

The survey area has a subhumid, temperate, continental climate. The subhumid climate has promoted moderately rapid soil development. Climate is uniform throughout the survey area, although its effect has been modified locally by relief and runoff.

Living organisms

Plants, micro-organisms, earthworms, and other forms of animal life are important in the formation of soils. Grasses and hardwood woody plants have affected soil formation in the survey area more than other living organisms. Soils that generally are low in organic matter, such as Cisco and Nimrod soils, formed under hardwood type vegetation. Soils that generally are high in organic matter, such as Abilene, Krum, and Leeray soils, formed under grasses.

Parent material

Parent material is the unconsolidated soil mass from which the soils were formed. It determines the limits of the chemical and mineralogical composition of the soil. In Brown and Mills Counties, the soils formed in material from four different geological systems. These are the Pennsylvanian, Permian, Cretaceous, and Quaternary Systems (*3*).

Pennsylvanian age materials in the survey area are mainly interbedded shale, limestone, and sandstone of the Strawn, Canyon, and Cisco Groups. The Strawn Group is mainly in the southeastern part of Brown County and the southwestern part of Mills County. The

Canyon Group is in the central part of Brown County, and the Cisco Group is in the western part. The Strawn and Cisco Groups are dominated by shale and sandstone, while the Canyon Group is dominated by limy shale and limestone. The Bonti soils formed in material weathered from acid sandstone, and the Callahan and Throck soils formed in material weathered from shale. The Speck, Lindy, and Tarrant soils formed in material weathered from limestone.

The Wichita Group of the Permian System covers the northwestern corner of Brown County and consists of shale, clay, sandstone, and limestone. Soils in this area are similar to those that developed in the Pennsylvanian rocks.

Most of the soils in the eastern part of Brown County were formed in material associated with the Cretaceous System. The Cisco, Pedernales, and Nimrod soils formed in sandy and loamy materials of the Trinity Group.

The Glen Rose Formation of the Trinity Group consists of limestone and soft marl. The Bolar and Brackett soils formed in the residuum of these materials. Just above the Trinity Group are rocks of the Fredericksburg Group, represented in this area by the Walnut Formation, Comanche Peak Limestone Formation, and Edwards Limestone Formation. The Denton, Real, Tarpley, and Tarrant soils formed in material weathered from these limestones. Most of the soils in Mills County formed in material weathered from limestones of the Glen Rose Formation and of the Fredericksburg Group.

The Pleistocene Series of the Quaternary System in the survey area consists of sand, clay, and gravel. These deposits are on old, high terraces and the second bottoms along the Colorado River, Pecan Bayou, and the major creeks. The Heaton, Desan, Rochelle, Bastrop, and Winters soils formed in these materials.

Recent geologic sediment is on all the flood plains of rivers and creeks. This material consists of calcareous sand, silt, and clay. The soils that formed in this sediment are the Bosque, Clairemont, Energy, Frio, Miller, and Weswood soils.

Topography

Topography, or relief, affects soil formation through its influence on drainage, runoff, erosion, plant cover, and soil temperature. The topography of the survey area ranges from gently sloping minor plains to broad, interstream divides with strongly sloping side slopes. Soils such as the Chaney and Winters soils, which formed in nearly level to gently sloping areas, are deeper and have more distinct horizons than soils such as the Brackett and Throck, which formed on hillsides and ridges. The soils in lower positions on the landscape are deeper and have more distinct horizons because they receive extra water, have less runoff, and are subject to less erosion.

Time

A long time generally is required for the formation of soils with distinct horizons. The differences in length of time that parent material has been in place, therefore, commonly reflect the degree of development of the soil profile. The soils in the survey area range from young to old. The young soils have very little profile development, and the old soils have well expressed horizons. Clairemont soils are an example of young soils with little development. Except for slight accumulation of organic matter and darkening of their surface layer, Clairemont soils retain most of the characteristics of their loamy parent material. Pedernales soils are an example of older soils with well developed horizons. They have developed a distinct surface layer and subsoil that bear little resemblance to the original parent material.

References

(1) American Association of State Highway [and Transportation] Officials. 1970. Standard specifications for highway materials and methods of sampling and testing. Ed. 10 2 vol., illus.

(2) American Society for Testing and Materials. 1974. Method for classification of soils for engineering purposes. ASTM Stand. D 2487-69. *In* 1974 Annual Book of ASTM Standards. Part 19, 464 pp., illus.

(3) Sellards, E.H., W.S. Adkins, and F.B. Plummer. 1932. Geology of Texas, stratigraphy, vol. 1. Univ. Texas Bull. 3232, 1007 pp., illus.

(4) Texas Conservation Needs Committee. 1970. Conservation needs inventory. U.S. Dep. Agric., Soil Conserv. Serv. publ., 297 pp., illus.

(5) United States Department of Agriculture. 1951. Soil survey manual. U.S. Dep. Agric. Handb. 18, 503 pp., illus. [Supplements replacing pp. 173-188 issued May 1962]

(6) United States Department of Agriculture. 1965. Predicting rainfall-erosion losses from cropland east of the Rocky Mountains. Agr. Res. Serv. U.S. Dep. Agric. Handb. No. 282, 47 pp.

(7) United States Department of Agriculture. 1975. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. Soil Conserv. Serv., U.S. Dep. Agric. Handb. 436, 754 pp., illus.

Glossary

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the differ-

ence between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Medium	6 to 9
High	9 to 12
Very high	More than 12

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Climax vegetation. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Depth, soil. In this soil survey, the following depth classes are used:

Very shallow: 3 to 8 inches of soil over bedrock or other impervious layer that severely restricts growth of roots.

Shallow: 8 to 20 inches of soil over bedrock or other impervious layer that severely restricts growth of roots.

Moderately deep: 20 to 40 inches of soil over bedrock or other impervious layer that restricts growth of roots.

Deep: More than 40 inches of soil.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically for long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Forb. Any herbaceous plant not a grass or a sedge.

Gilgai. Commonly a succession of microbasins and microknolls in nearly level areas or of microvalleys and microridges parallel with the slope. Typically, the microrelief of Vertisols—clayey soils having a high coefficient of expansion and contraction with changes in moisture content.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual*. The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Large stones (in tables). Rock fragments 3 inches (7.5 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Low strength. The soil is not strong enough to support loads.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mott. A small grove of trees on a prairie.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent.* The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.20 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	Less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in a mature soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so

that it can soak into the soil or flow slowly to a prepared outlet without harm. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt, silt loam, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the low lands along streams.

TABLES

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Recorded in the period 1951-76 at Brownwood, Texas]

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days[1]	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January	57.3	31.9	44.7	83	10	64	1.45	.11	2.38	3	.8
February	61.4	35.3	48.4	86	15	84	1.47	.62	2.16	3	1.0
March	69.4	42.8	56.1	93	23	253	1.38	.24	2.26	3	.2
April	79.0	53.7	66.4	96	32	492	2.71	1.29	3.86	4	.0
May	85.3	61.6	73.5	101	44	729	3.95	1.89	5.63	5	.0
June	92.9	69.2	81.1	103	56	933	3.04	.68	4.88	4	.0
July	97.0	72.5	84.8	107	63	1,079	1.63	.28	2.66	3	.0
August	96.6	71.4	84.0	106	61	1,054	1.87	.33	3.06	3	.0
September	89.0	65.1	77.0	102	48	810	3.21	.89	5.07	4	.0
October	79.4	54.2	66.8	95	36	521	3.32	.71	5.37	3	.0
November	66.7	42.1	54.4	85	23	172	1.48	.44	2.32	3	.2
December	59.6	34.1	46.9	81	16	64	1.24	.35	1.98	3	.0
Yearly:											
Average	77.8	52.8	65.3	---	---	---	---	---	---	---	---
Extreme	---	---	---	108	10	---	---	---	---	---	---
Total	---	---	---	---	---	6,255	26.75	20.23	32.85	41	2.2

[1]A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50 °F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Recorded in the period 1951-76 at Brownwood, Texas]

Probability	Temperature		
	24 °F or lower	28 °F or lower	32 °F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	March 15	March 24	April 6
2 years in 10 later than--	March 6	March 18	April 2
5 years in 10 later than--	February 16	March 5	March 23
First freezing temperature in fall:			
1 year in 10 earlier than--	November 17	November 11	October 31
2 years in 10 earlier than--	November 26	November 17	November 6
5 years in 10 earlier than--	December 14	November 29	November 16

TABLE 3.--GROWING SEASON

[Recorded in the period 1951-76 at Brownwood, Texas]

Probability	Daily minimum temperature during growing season		
	Higher than 24 °F	Higher than 28 °F	Higher than 32 °F
	Days	Days	Days
9 years in 10	265	243	220
8 years in 10	276	251	226
5 years in 10	298	268	237
2 years in 10	321	284	249
1 year in 10	335	292	255

TABLE 4.--POTENTIALS AND LIMITATIONS OF MAP UNITS ON THE GENERAL SOIL MAP FOR SPECIFIED USES

Map units	Percent of area	Cropland	Rangeland	Pastureland	Urban uses	Recreation
1. Callahan-Throck-Bonti.	17	Low: slope, large stones.	Medium: large stones.	Medium: large stones, rooting depth.	Medium: slope, shrink-swell.	Medium: slope, large stones.
2. Bolar-Brackett---	16	Low: slope, large stones.	Medium: rooting depth.	Low: large stones, rooting depth.	Medium: shrink-swell, depth to rock.	Medium: slope, small stones.
3. Tarrant-Tarpley--	12	Low: rooting depth, large stones.	Medium: rooting depth.	Low: large stones, rooting depth.	Low: shrink-swell, depth to rock.	Low: large stones, too clayey.
4. Doudle-Real------	11	Low: slope, rooting depth, small stones.	Medium: rooting depth.	Low: rooting depth, small stones.	Medium: depth to rock.	Medium: small stones.
5. Speck-Tarrant----	9	Low: large stones, rooting depth.	Medium: rooting depth.	Low: large stones, rooting depth.	Low: depth to rock, shrink-swell.	Low: large stones, too clayey.
6. Frio-Sunev-Winters.	8	High----------	High----------	High----------	Low: floods.	Medium: too clayey, floods.
7. Weswood-Clairemont.	2	High----------	High----------	High----------	Low: floods.	Medium: floods.
8. Pedernales-Menard-Rext.	7	Medium: droughty.	Medium: droughty.	Medium: droughty.	Medium: shrink-swell.	High.
9. Leeray-Sagerton-Nukrum.	7	High----------	Medium: droughty.	High----------	Low: shrink-swell.	Medium: too clayey.
10. Krum-Bolar-Denton	6	High----------	High----------	High----------	Low: shrink-swell.	Medium: too clayey.
11. Bastrop-Winters-Sagerton.	1	High----------	High----------	High----------	Medium: shrink-swell.	High.
12. Pedernales-Nimrod-Chaney.	4	High----------	High----------	High----------	Medium: shrink-swell.	Medium: too sandy.

TABLE 5.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Brown County	Mills County	Total-- Area	Total-- Extent
		Acres	Acres	Acres	Pct
1	Abilene clay loam, 0 to 1 percent slopes	4,600	20	4,620	0.4
2	Abilene clay loam, 1 to 3 percent slopes	6,230	2,920	9,150	0.8
3	Abilene-Urban land complex, 0 to 2 percent slopes	890	0	890	0.1
4	Bastrop fine sandy loam, 1 to 3 percent slopes	1,650	2,700	4,350	0.4
5	Bolar clay loam, 2 to 5 percent slopes	7,250	38,770	46,020	4.2
6	Bolar-Brackett association, undulating	17,520	63,380	80,900	7.4
7	Bonti fine sandy loam, 1 to 3 percent slopes	11,510	2,570	14,080	1.3
8	Bonti fine sandy loam, 2 to 5 percent slopes, eroded	1,500	1,350	2,850	0.3
9	Bonti-Urban land complex, 1 to 5 percent slopes	220	0	220	(1)
10	Bonti-Callahan association, undulating	25,270	1,880	27,150	2.5
11	Bonti-Throck association, hilly	9,760	16,290	26,050	2.4
12	Bosque loam, occasionally flooded	7,830	200	8,030	0.7
13	Brackett association, undulating	9,580	2,730	12,310	1.1
14	Brackett-Tarrant association, hilly	4,350	950	5,300	0.5
15	Callahan loam, 1 to 3 percent slopes	13,700	240	13,940	1.3
16	Callahan loam, 1 to 5 percent slopes, eroded	7,240	380	7,620	0.7
17	Callahan-Urban land complex, 1 to 5 percent slopes	940	0	940	0.1
18	Callahan-Throck association, undulating	51,370	38,810	90,180	8.3
19	Caradan clay loam, 1 to 3 percent slopes	1,860	3,720	5,580	0.5
20	Chaney loamy fine sand, 1 to 5 percent slopes	4,600	30	4,630	0.4
21	Cisco loamy fine sand, 1 to 3 percent slopes	1,660	610	2,270	0.2
22	Cisco fine sandy loam, 1 to 3 percent slopes	2,410	310	2,720	0.3
23	Cisco fine sandy loam, 2 to 5 percent slopes, eroded	2,440	110	2,550	0.2
24	Clairemont soils, frequently flooded	1,230	3,790	5,020	0.5
25	Deleon silty clay	6,190	810	7,000	0.6
26	Deleon-Urban land complex, 0 to 1 percent slopes	230	0	230	(1)
27	Denton silty clay, 1 to 3 percent slopes	2,510	3,520	6,030	0.6
28	Desan loamy fine sand, 0 to 5 percent slopes	0	1,190	1,190	0.1
29	Doudle-Real association, undulating	40,380	55,430	95,810	8.8
30	Energy fine sandy loam, occasionally flooded	4,160	60	4,220	0.4
31	Frio silty clay loam, occasionally flooded	18,520	13,030	31,550	2.9
32	Frio silty clay loam, frequently flooded	13,540	1,480	15,020	1.4
33	Frio-Urban land complex, 0 to 1 percent slopes	340	0	340	(1)
34	Heaton loamy fine sand, 0 to 3 percent slopes	70	1,220	1,290	0.1
35	Hext loam, 1 to 3 percent slopes	4,070	2,590	6,660	0.6
36	Hext loam, 3 to 5 percent slopes	4,660	1,270	5,930	0.5
37	Hext-Brackett complex, 1 to 8 percent slopes	4,760	400	5,160	0.5
38	Kavett silty clay, 1 to 3 percent slopes	3,370	0	3,370	0.3
39	Krum silty clay, 1 to 3 percent slopes	1,610	23,700	25,310	2.3
40	Leeray clay, 0 to 1 percent slopes	5,360	1,760	7,120	0.7
41	Leeray clay, 1 to 3 percent slopes	22,740	1,990	24,730	2.3
42	Lindy clay loam, 1 to 3 percent slopes	4,280	0	4,280	0.4
43	May fine sandy loam, 0 to 1 percent slopes	1,620	20	1,640	0.2
44	May fine sandy loam, 1 to 3 percent slopes	1,200	100	1,300	0.1
45	Menard fine sandy loam, 1 to 3 percent slopes	8,050	920	8,970	0.8
46	Menard fine sandy loam, 3 to 5 percent slopes	1,040	420	1,460	0.1
47	Menard fine sandy loam, 2 to 5 percent slopes, eroded	10,970	1,500	12,470	1.1
48	Menard fine sandy loam, 5 to 8 percent slopes	870	220	1,090	0.1
49	Menard-Hext association, gently undulating	6,180	330	6,510	0.6
50	Mereta clay loam, 1 to 3 percent slopes	2,070	1,860	3,930	0.4
51	Miller silty clay, occasionally flooded	500	520	1,020	0.1
52	Nimrod fine sand, 0 to 5 percent slopes	7,740	310	8,050	0.7
53	Nukrum silty clay, 1 to 3 percent slopes	16,960	0	16,960	1.6
54	Nukrum-Urban land complex, 1 to 4 percent slopes	900	0	900	0.1
55	Nuvalde clay loam, 1 to 3 percent slopes	6,740	80	6,820	0.6
56	Patilo fine sand, 1 to 5 percent slopes	1,530	250	1,780	0.2
57	Pedernales loamy fine sand, 1 to 5 percent slopes	9,640	90	9,730	0.9
58	Pedernales fine sandy loam, 1 to 3 percent slopes	17,170	7,520	24,690	2.3
59	Pedernales fine sandy loam, 3 to 5 percent slopes	860	680	1,540	0.1
60	Pedernales fine sandy loam, 2 to 5 percent slopes, eroded	12,520	3,380	15,900	1.5
61	Real association, hilly	6,780	14,450	21,230	2.0
62	Real-Tarrant association, hilly	4,070	11,820	15,890	1.5
63	Rochelle fine sandy loam, 1 to 5 percent slopes	3,350	600	3,950	0.4
64	Rowena clay loam, 0 to 1 percent slopes	800	190	990	0.1
65	Rowena clay loam, 1 to 3 percent slopes	2,510	350	2,860	0.3
66	Sagerton clay loam, 0 to 1 percent slopes	4,380	1,230	5,610	0.5
67	Sagerton clay loam, 1 to 3 percent slopes	14,590	2,900	17,490	1.6
68	Sagerton-Urban land complex, 0 to 3 percent slopes	740	0	740	0.1
69	Speck clay loam, 1 to 3 percent slopes	8,880	0	8,880	0.8

See footnote at end of table.

TABLE 5.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Brown County	Mills County	Total-- Area	Total-- Extent
		Acres	Acres	Acres	Pct
70	Speck-Urban land complex, 1 to 3 percent slopes	690	0	690	0.1
71	Speck-Tarrant association, gently undulating	67,920	0	67,920	6.3
72	Sunev clay loam, 1 to 3 percent slopes	4,510	23,570	28,080	2.6
73	Tarpley clay loam, 1 to 3 percent slopes	930	5,440	6,370	0.6
74	Tarpley-Tarrant association, gently undulating	6,870	40,120	46,990	4.3
75	Tarrant-Tarpley association, undulating	1,610	47,930	49,540	4.6
76	Throck association, hilly	24,220	1,100	25,320	2.3
77	Weswood silt loam, occasionally flooded	620	5,460	6,080	0.6
78	Winters fine sandy loam, 0 to 1 percent slopes	1,230	270	1,500	0.1
79	Winters fine sandy loam, 1 to 3 percent slopes	12,230	4,660	16,890	1.6
80	Winters fine sandy loam, 2 to 5 percent slopes, eroded	940	1,070	2,010	0.2
81	Winters-Urban land complex, 1 to 3 percent slopes	850	0	850	0.1
	Water	7,360	190	7,550	0.7
	Total	615,040	469,760	1,084,800	100.0

[1]Less than 0.1 percent.

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Soil name and map symbol	Grain sorghum	Wheat	Peanuts	Improved bermudagrass
	Bu	Bu	Lb	AUM[1]
Abilene:				
1	45	25	---	5.0
2	40	25	---	5.0
2 3	---	---	---	---
Bastrop:				
4	45	25	1,200	5.5
Bolar:				
5	35	25	---	5.0
2 6:				
Bolar part	---	---	---	---
Brackett part.				
Bonti:				
7	40	35	800	4.0
8	30	25	---	3.0
2 9	---	---	---	---
2 10:				
Bonti part	---	---	---	---
Callahan part	---	---	---	---
2 11:				
Bonti part	---	---	---	---
Throck part	---	---	---	---
Bosque:				
12	65	30	1,200	6.5
Brackett:				
2 13	---	---	---	---
2 14:				
Brackett part	---	---	---	---
Tarrant part	---	---	---	---
Callahan:				
15	30	24	---	4.0
16	25	15	---	3.0
2 17	---	---	---	---
2 18:				
Callahan part	---	---	---	---
Throck part	---	---	---	---
Caradan:				
19	45	20	---	5.5
Chaney:				
20	35	---	1,200	6.0
Cisco:				
21	40	---	1,400	6.0

See footnotes at end of table.

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Grain sorghum	Wheat	Peanuts	Improved bermudagrass
	Bu	Bu	Lb	AUM[1]
Cisco:				
22	45	25	1,200	6.0
23	30	20	800	4.5
Clairemont:				
[2]24	---	---	---	6.5
Deleon:				
25	70	30	---	6.5
[2]26	---	---	---	---
Denton:				
27	55	25	---	6.0
Desan:				
28	30	---	1,000	4.5
Doudle:				
[2]29:				
Doudle part	---	---	---	---
Real part	---	---	---	---
Energy:				
30	70	30	1,200	6.5
Frio:				
31	75	30	---	7.0
32	---	---	---	7.0
[2]33	---	---	---	---
Heaton:				
34	40	---	1,200	5.5
Hext:				
35	30	20	---	5.5
36	25	15	---	5.0
[2]37	---	---	---	---
Kavett:				
38	20	15	---	2.0
Krum:				
39	60	30	---	6.0
Leeray:				
40	55	25	---	5.0
41	45	25	---	4.5
Lindy:				
42	45	25	---	5.0
May:				
43, 44	55	25	1,200	6.5
Menard:				
45	30	25	1,200	5.5
46	25	20	1,000	5.0
47	25	20	800	4.5
48	20	20	---	5.0

See footnotes at end of table.

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Grain sorghum	Wheat	Peanuts	Improved bermudagrass
	Bu	Bu	Lb	AUM[1]
Menard:				
249:				
Menard part	25	20	---	5.0
Hext part	25	15	---	5.0
Mereta:				
50	20	15	---	2.5
Miller:				
51	60	30	---	6.5
Nimrod:				
52	40	---	1,200	5.5
Nukrum:				
53	55	25	---	6.0
254	---	---	---	---
Nuvalde:				
55	35	20	---	5.0
Patilo:				
56	30	---	1,000	4.5
Pedernales:				
57	35	20	1,200	5.5
58	35	25	1,000	5.5
59	35	20	800	5.0
60	20	20	700	5.0
Real:				
261	---	---	---	---
262:				
Real part	---	---	---	---
Tarrant part	---	---	---	---
Rochelle:				
63	20	15	---	3.0
Rowena:				
64	35	25	---	5.0
65	30	20	---	5.0
Sagerton:				
66	45	25	---	5.5
67	40	20	---	5.5
268	---	---	---	---
Speck:				
69	20	15	---	2.0
270	---	---	---	---
271:				
Speck part	---	---	---	---
Tarrant part	---	---	---	---
Sunev:				
72	55	25	---	6.5

See footnotes at end of table.

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Grain sorghum	Wheat	Peanuts	Improved bermudagrass
	Bu	Bu	Lb	AUM[1]
Tarpley:				
73	25	15	---	2.5
[2]74:				
Tarpley part	---	---	---	---
Tarrant part	---	---	---	---
Tarrant:				
[2]75:				
Tarrant part	---	---	---	---
Tarpley part	---	---	---	---
Throck:				
[2]76	---	---	---	---
Weswood:				
77	70	30	1,200	7.0
Winters:				
78	55	25	1,000	5.5
79	50	20	800	5.0
80	40	15	---	4.5
[2]81	---	---	---	---

[1]Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

[2]This map unit is made up of two or more dominant kinds of soil. See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 7.--CAPABILITY CLASSES AND SUBCLASSES

[Miscellaneous areas are excluded. Absence of an entry indicates no acreage]

Class	Total Acreage		Major management concerns (Subclass)							
			Erosion (e)		Wetness (w)		Soil Problem (s)		Climate (c)	
	Brown County	Mills County	Brown County	Mills County	Brown County	Mills County	Brown County	Mills County	Brown County	Mills County
			Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres
I	1,620	20	---	---	---	---	---	---	---	---
II	162,490	97,090	115,390	76,090	31,130	18,750	6,190	810	9,780	1,400
III	129,590	69,698	123,730	67,418	500	520	5,360	1,760	---	---
IV	18,950	330	18,950	330	---	---	---	---	---	---
V	14,770	5,270	---	---	14,770	5,270	---	---	---	---
VI	225,280	250,680	4,760	400	---	---	220,520	250,280	---	---
VII	49,180	44,610	---	---	---	---	49,180	44,610	---	---

TABLE 8.--RANGE PRODUCTIVITY AND COMPOSITION

[Soils not listed are not in range sites; such soils can be used for grazing if grass cover is established]

Soil name and map symbol	Range site name	Potential production		Common plant name	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
Abilene:					
1, 2	Clay Loam	Favorable	4,500	Sideoats grama	20
		Normal	3,500	Vine-mesquite	15
		Unfavorable	2,500	Silver bluestem	10
				Buffalograss	10
				Texas needlegrass	5
				White tridens	5
Bastrop:					
4	Sandy Loam	Favorable	4,500	Little bluestem	20
		Normal	4,000	Indiangrass	10
		Unfavorable	2,000	Sideoats grama	10
				Switchgrass	5
				Purpletop	5
				Post oak	5
				Blackjack oak	5
				Canada wildrye	5
				Buffalograss	5
Bolar:					
5	Clay Loam	Favorable	6,000	Little bluestem	20
		Normal	4,000	Indiangrass	15
		Unfavorable	2,000	Big bluestem	10
				Sideoats grama	10
				Silver bluestem	5
				Tall dropseed	5
				Texas needlegrass	5
				Canada wildrye	5
[1]6:					
Bolar part	Clay Loam	Favorable	6,000	Little bluestem	20
		Normal	5,000	Indiangrass	15
		Unfavorable	3,000	Big bluestem	10
				Sideoats grama	10
				Silver bluestem	5
				Tall dropseed	5
				Texas needlegrass	5
				Canada wildrye	5
Brackett part	Adobe	Favorable	4,000	Little bluestem	40
		Normal	3,200	Sideoats grama	8
		Unfavorable	1,800	Tall grama	7
				Indiangrass	5
				Silver bluestem	5
Bonti:					
7, 8	Sandy Loam	Favorable	4,500	Little bluestem	20
		Normal	4,000	Indiangrass	10
		Unfavorable	2,000	Sideoats grama	10
				Purpletop	5
				Post oak	5
				Blackjack oak	5
				Canada wildrye	5
				Buffalograss	5
[1]10:					
Bonti part	Sandy Loam	Favorable	4,500	Little bluestem	20
		Normal	4,000	Indiangrass	10
		Unfavorable	2,000	Sideoats grama	10
				Purpletop	5
				Post oak	5
				Blackjack oak	5
				Canada wildrye	5
				Buffalograss	5

See footnote at end of table.

TABLE 8.--RANGE PRODUCTIVITY AND COMPOSITION--Continued

Soil name and map symbol	Range site name	Potential production		Common plant name	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
Bonti:					
Callahan part---	Claypan Prairie----------	Favorable	4,000	Silver bluestem----------	15
		Normal	3,500	Sideoats grama----------	15
		Unfavorable	3,000	Texas needlegrass----------	15
				Vine-mesquite----------	10
				White tridens----------	10
				Buffalograss----------	10
[1]11:					
Bonti part------	Sandstone Hills----------	Favorable	4,000	Little bluestem----------	35
		Normal	3,000	Indiangrass----------	10
		Unfavorable	2,500	Sideoats grama----------	10
				Post oak----------	7
				Big bluestem----------	5
				Sand lovegrass----------	5
				Switchgrass----------	5
Throck part-----	Rocky Hills----------	Favorable	4,000	Sideoats grama----------	15
		Normal	3,000	Little bluestem----------	15
		Unfavorable	1,500	Texas cupgrass----------	10
				Hairy dropseed----------	10
				Indiangrass----------	5
				Buffalograss----------	5
				White tridens----------	5
				Texas needlegrass----------	5
Bosque:					
12----------	Loamy Bottomland----------	Favorable	6,500	Indiangrass----------	20
		Normal	5,000	Little bluestem----------	15
		Unfavorable	3,500	Switchgrass----------	15
				Big bluestem----------	10
				Sideoats grama----------	5
				Canada wildrye----------	5
				Vine-mesquite----------	5
				Texas needlegrass----------	5
				Tall dropseed----------	5
Brackett:					
[1]13----------	Adobe----------	Favorable	4,000	Little bluestem----------	40
		Normal	3,200	Sideoats grama----------	8
		Unfavorable	1,800	Tall grama----------	7
				Indiangrass----------	5
				Silver bluestem----------	5
[1]14:					
Brackett part---	Steep Adobe----------	Favorable	3,000	Little bluestem----------	30
		Normal	2,200	Sideoats grama----------	10
		Unfavorable	1,500	Tall grama----------	10
				Indiangrass----------	10
				Tall dropseed----------	5
				Silver bluestem----------	5
				Slim tridens----------	5
				Hairy grama----------	5
Tarrant part----	Steep Rocky----------	Favorable	1,800	Sideoats grama----------	20
		Normal	1,400	Silver bluestem----------	15
		Unfavorable	800	Little bluestem----------	10
				Green sprangletop----------	10
				Indiangrass----------	5
				Fall witchgrass----------	5
				Live oak----------	5

See footnote at end of table.

TABLE 8.--RANGE PRODUCTIVITY AND COMPOSITION--Continued

Soil name and map symbol	Range site name	Potential production		Common plant name	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
Callanan:					
15, 16	Claypan Prairie	Favorable	4,000	Silver bluestem	15
		Normal	3,500	Sideoats grama	15
		Unfavorable	3,000	Texas needlegrass	15
				Arizona cottontop	10
				White tridens	10
				Buffalograss	10
				Vine-mesquite	5
[1]18:					
Callahan part	Claypan Prairie	Favorable	4,000	Silver bluestem	15
		Normal	3,500	Sideoats grama	15
		Unfavorable	3,000	Texas needlegrass	15
				Arizona cottontop	10
				White tridens	10
				Buffalograss	10
				Vine-mesquite	5
Throck part	Shallow Clay	Favorable	3,500	Sideoats grama	20
		Normal	2,500	Buffalograss	20
		Unfavorable	1,200	Vine-mesquite	10
				Texas needlegrass	10
				Arizona cottontop	10
				Silver bluestem	5
Caradan:					
19	Deep Redland	Favorable	6,000	Little bluestem	30
		Normal	5,000	Big bluestem	10
		Unfavorable	3,000	Indiangrass	10
				Sideoats grama	10
				Texas needlegrass	10
				Silver bluestem	5
				White tridens	5
				Buffalograss	5
Chaney:					
20	Loamy Sand	Favorable	4,500	Little bluestem	25
		Normal	4,000	Big bluestem	10
		Unfavorable	3,000	Indiangrass	10
				Post oak	10
				Silver bluestem	5
				Scribner panicum	5
				Sand lovegrass	5
				Purpletop	5
Cisco:					
21	Loamy Sand	Favorable	4,500	Little bluestem	25
		Normal	4,000	Big bluestem	10
		Unfavorable	3,000	Indiangrass	10
				Post oak	10
				Silver bluestem	5
				Scribner panicum	5
				Sand lovegrass	5
				Tall dropseed	5
				Purpletop	5
22, 23	Sandy Loam	Favorable	4,500	Little bluestem	20
		Normal	4,000	Indiangrass	10
		Unfavorable	2,000	Sideoats grama	10
				Purpletop	5
				Post oak	5
				Blackjack oak	5
				Canada wildrye	5
				Buffalograss	5

See footnote at end of table.

TABLE 8.--RANGE PRODUCTIVITY AND COMPOSITION--Continued

Soil name and map symbol	Range site name	Potential production		Common plant name	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
Clairemont:					
24	Loamy Bottomland	Favorable	5,500	Sideoats grama	20
		Normal	4,500	Sand bluestem	10
		Unfavorable	3,500	Indiangrass	10
				Vine-mesquite	10
				Switchgrass	5
				Little bluestem	5
				Arizona cottontop	5
				Texas needlegrass	5
				Plains bristlegrass	5
Deleon:					
25	Clayey Bottomland	Favorable	5,000	Vine-mesquite	25
		Normal	4,000	Texas needlegrass	15
		Unfavorable	3,000	White tridens	10
				Canada wildrye	10
				Little bluestem	10
				Arizona cottontop	10
				Buffalograss	5
				Indiangrass	5
Denton:					
27	Clay Loam	Favorable	6,500	Little bluestem	20
		Normal	5,000	Indiangrass	15
		Unfavorable	3,000	Sideoats grama	10
				Big bluestem	10
				Switchgrass	5
				Silver bluestem	5
				Texas needlegrass	5
				Tall dropseed	5
Desan:					
28	Deep Sand	Favorable	3,000	Post oak	15
		Normal	2,000	Sand lovegrass	10
		Unfavorable	1,000	Blackjack oak	10
				Purpletop	5
				Indiangrass	5
				Red lovegrass	5
				Scribner panicum	5
				Fringeleaf paspalum	5
Doudle:					
29:					
Doudle part	Pink Caliche	Favorable	3,250	Little bluestem	25
		Normal	2,800	Sideoats grama	15
		Unfavorable	2,500	Hairy dropseed	10
				Texas needlegrass	10
				Live oak	10
				Indiangrass	5
				Silver bluestem	5
Real part	Adobe	Favorable	3,500	Little bluestem	40
		Normal	2,500	Big bluestem	10
		Unfavorable	1,500	Indiangrass	10
				Sideoats grama	10
Energy:					
30	Loamy Bottomland	Favorable	6,500	Indiangrass	20
		Normal	5,000	Switchgrass	15
		Unfavorable	3,500	Big bluestem	10
				Little bluestem	10
				Tall dropseed	5
				Texas needlegrass	5
				Sideoats grama	5
				Vine-mesquite	5

See footnote at end of table.

TABLE 8.--RANGE PRODUCTIVITY AND COMPOSITION--Continued

Soil name and map symbol	Range site name	Potential production		Common plant name	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
Frio:					
31, 32	Loamy Bottomland	Favorable	5,500	Big bluestem	10
		Normal	4,000	Little bluestem	10
		Unfavorable	3,000	Vine-mesquite	10
				Switchgrass	5
				Indiangrass	5
				Eastern gamagrass	5
				Texas needlegrass	5
				Plains lovegrass	5
				Canada wildrye	5
				Cane bluestem	5
				Southwestern bristlegrass	5
Heaton:					
34	Sandy	Favorable	4,500	Little bluestem	25
		Normal	3,500	Big bluestem	10
		Unfavorable	2,000	Indiangrass	10
				Post oak	8
				Blackjack oak	7
				Sand lovegrass	5
				Purpletop	5
				Tall dropseed	5
				Silver bluestem	5
				Scribner panicum	5
Hext:					
35, 36	Sandy Loam	Favorable	4,500	Little bluestem	20
		Normal	4,000	Indiangrass	10
		Unfavorable	2,000	Sideoats grama	10
				Post oak	5
				Blackjack oak	5
				Canada wildrye	5
				Buffalograss	5
[1]37:					
Hext part	Sandy Loam	Favorable	4,500	Little bluestem	20
		Normal	4,000	Indiangrass	10
		Unfavorable	2,000	Sideoats grama	10
				Post oak	5
				Blackjack oak	5
				Canada wildrye	5
				Buffalograss	5
Brackett part	Adobe	Favorable	4,000	Little bluestem	40
		Normal	3,200	Sideoats grama	8
		Unfavorable	1,800	Tall grama	7
				Indiangrass	5
				Silver bluestem	5
Kavett:					
38	Shallow	Favorable	3,000	Sideoats grama	30
		Normal	2,500	Little bluestem	25
		Unfavorable	2,000	Cane bluestem	5
				Plains lovegrass	5
				Vine-mesquite	5
				Texas needlegrass	5
				Curlymesquite	5
				Buffalograss	5
				Fall witchgrass	5
Krum:					
39	Clay Loam	Favorable	6,500	Little bluestem	50
		Normal	6,000	Big bluestem	15
		Unfavorable	4,000	Indiangrass	10

See footnote at end of table.

TABLE 8.--RANGE PRODUCTIVITY AND COMPOSITION--Continued

Soil name and map symbol	Range site name	Potential production		Common plant name	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
Leeray:					
40, 41	Clay Loam	Favorable	4,500	Sideoats grama	25
		Normal	3,500	Vine-mesquite	20
		Unfavorable	2,500	Silver bluestem	10
				Buffalograss	10
				Texas needlegrass	10
				White tridens	5
				Tall dropseed	5
Lindy:					
42	Deep Redland	Favorable	6,000	Big bluestem	20
		Normal	5,000	Indiangrass	20
		Unfavorable	4,000	Little bluestem	15
				Sideoats grama	5
				Tall dropseed	5
				Silver bluestem	5
				Plains lovegrass	5
				Texas needlegrass	5
				Canada wildrye	5
May:					
43, 44	Sandy Loam	Favorable	4,500	Little bluestem	20
		Normal	4,000	Indiangrass	10
		Unfavorable	2,000	Sideoats grama	10
				Post oak	5
				Blackjack oak	5
				Canada wildrye	5
				Buffalograss	5
Menard:					
45, 46, 47, 48	Sandy Loam	Favorable	4,500	Little bluestem	20
		Normal	4,000	Indiangrass	10
		Unfavorable	2,000	Sideoats grama	5
				Purpletop	5
				Post oak	5
				Blackjack oak	5
				Canada wildrye	5
				Buffalograss	5
[1]49:					
Menard part	Sandy Loam	Favorable	4,500	Little bluestem	20
		Normal	4,000	Indiangrass	10
		Unfavorable	2,000	Sideoats grama	5
				Purpletop	5
				Post oak	5
				Blackjack oak	5
				Canada wildrye	5
				Buffalograss	5
Hext part	Sandy Loam	Favorable	4,500	Little bluestem	20
		Normal	4,000	Indiangrass	10
		Unfavorable	2,000	Sideoats grama	10
				Purpletop	5
				Post oak	5
				Blackjack oak	5
				Canada wildrye	5
				Buffalograss	5
Mereta:					
50	Shallow	Favorable	3,000	Sideoats grama	25
		Normal	2,500	Buffalograss	13
		Unfavorable	2,000	Curly mesquite	10
				Slim tridens	10

See footnote at end of table.

TABLE 8.--RANGE PRODUCTIVITY AND COMPOSITION--Continued

Soil name and map symbol	Range site name	Potential production		Common plant name	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
Miller:					
51	Clayey Bottomland	Favorable	5,000	Vine-mesquite	25
		Normal	3,200	White tridens	20
		Unfavorable	2,000	Texas needlegrass	15
				Canada wildrye	10
				Arizona cottontop	10
Nimrod:					
52	Sandy	Favorable	4,500	Little bluestem	25
		Normal	3,500	Big bluestem	10
		Unfavorable	2,000	Indiangrass	10
				Post oak	8
				Blackjack oak	7
				Sand lovegrass	5
				Purpletop	5
				Tall dropseed	5
				Silver bluestem	5
				Scribner panicum	5
Nukrum:					
53	Clay Loam	Favorable	4,500	Sideoats grama	25
		Normal	3,500	Vine-mesquite	20
		Unfavorable	2,500	Silver bluestem	10
				Buffalograss	10
				Texas needlegrass	10
				White tridens	5
				Tall dropseed	5
Nuvalde:					
55	Clay Loam	Favorable	4,500	Sideoats grama	25
		Normal	3,500	Vine-mesquite	15
		Unfavorable	2,000	Silver bluestem	10
				Texas needlegrass	10
				Buffalograss	10
				Canada wildrye	5
				Texas cupgrass	5
				Tall dropseed	5
Patilo:					
56	Deep Sand	Favorable	3,000	Post oak	15
		Normal	2,000	Sand lovegrass	10
		Unfavorable	1,000	Blackjack oak	10
				Purpletop	5
				Little bluestem	5
				Red lovegrass	5
				Scribner panicum	5
				Fringeleaf paspalum	5
Pedernales:					
57	Loamy Sand	Favorable	4,000	Little bluestem	40
		Normal	3,500	Sand lovegrass	15
		Unfavorable	2,000	Big bluestem	5
				Canada wildrye	5
				Indiangrass	5
				Purpletop	5
				Fringeleaf paspalum	5
58, 59, 60	Tight Sandy Loam	Favorable	3,500	Sideoats grama	25
		Normal	3,000	Little bluestem	15
		Unfavorable	1,500	Pinhole bluestem	10
				Vine-mesquite	10
				Arizona cottontop	5
				Canada wildrye	5
				Texas needlegrass	5

See footnote at end of table.

TABLE 8.--RANGE PRODUCTIVITY AND COMPOSITION--Continued

Soil name and map symbol	Range site name	Potential production		Common plant name	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
Real:					
[1]61	Steep Adobe	Favorable	3,500	Little bluestem	40
		Normal	2,500	Sideoats grama	15
		Unfavorable	1,500	Indiangrass	10
[1]62:					
Real part	Steep Adobe	Favorable	3,500	Little bluestem	40
		Normal	2,500	Sideoats grama	15
		Unfavorable	1,500	Indiangrass	10
Tarrant part	Steep Rocky	Favorable	1,800	Sideoats grama	20
		Normal	1,400	Silver bluestem	15
		Unfavorable	800	Little bluestem	10
				Green sprangletop	10
				Indiangrass	5
				Fall witchgrass	5
				Live oak	5
Rochelle:					
63	Sandy Loam	Favorable	4,500	Little bluestem	20
		Normal	4,000	Indiangrass	10
		Unfavorable	2,000	Sideoats grama	10
				Purpletop	5
				Post oak	5
				Blackjack oak	5
				Canada wildrye	5
				Buffalograss	5
Rowena:					
64, 65	Clay Loam	Favorable	4,500	Sideoats grama	20
		Normal	3,500	Arizona cottontop	15
		Unfavorable	2,500	Vine-mesquite	15
				Buffalograss	10
				Plains bristlegrass	5
				Silver bluestem	5
				Texas needlegrass	5
				White tridens	5
Sagerton:					
66, 67	Clay Loam	Favorable	4,500	Sideoats grama	20
		Normal	3,500	Vine-mesquite	15
		Unfavorable	2,500	Arizona cottontop	15
				Buffalograss	10
				Silver bluestem	5
				Texas needlegrass	5
				Sand dropseed	5
Speck:					
69	Redland	Favorable	3,800	Little bluestem	25
		Normal	3,000	Sideoats grama	15
		Unfavorable	2,000	Texas needlegrass	10
				Tall dropseed	10
				Texas cupgrass	10
				Big bluestem	5
				Indiangrass	5
				Silver bluestem	5
				Live oak	5
				Post oak	5

See footnote at end of table.

TABLE 8.--RANGE PRODUCTIVITY AND COMPOSITION--Continued

Soil name and map symbol	Range site name	Potential production		Common plant name	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
171:					
Speck part	Redland	Favorable	3,800	Little bluestem	25
		Normal	3,000	Sideoats grama	15
		Unfavorable	2,000	Texas needlegrass	10
				Tall dropseed	10
				Texas cupgrass	10
				Big bluestem	5
				Indiangrass	5
				Silver bluestem	5
				Live oak	5
				Post oak	5
Tarrant part	Low Stony Hills	Favorable	2,500	Little bluestem	15
		Normal	1,800	Sideoats grama	15
		Unfavorable	1,200	Curlymesquite	10
				Buffalograss	5
				Green sprangletop	5
				Texas needlegrass	5
				Texas cupgrass	5
				Tall dropseed	5
				Silver bluestem	5
				Live oak	5
Sunev:					
172	Clay Loam	Favorable	7,000	Little bluestem	50
		Normal	5,500	Indiangrass	15
		Unfavorable	3,500	Big bluestem	10
Tarpley:					
173	Redland	Favorable	4,500	Little bluestem	25
		Normal	3,500	Indiangrass	15
		Unfavorable	2,500	Big bluestem	10
				Texas needlegrass	10
				Sideoats grama	5
				Tall dropseed	5
				Silver bluestem	5
				White shin oak	5
				Live oak	5
				Post oak	5
174:					
Tarpley part	Redland	Favorable	4,500	Little bluestem	25
		Normal	3,500	Indiangrass	15
		Unfavorable	2,500	Big bluestem	10
				Texas needlegrass	10
				Sideoats grama	5
				Tall dropseed	5
				Silver bluestem	5
				White shin oak	5
				Live oak	5
				Post oak	5
Tarrant part	Low Stony Hills	Favorable	2,500	Little bluestem	15
		Normal	1,800	Sideoats grama	15
		Unfavorable	1,200	Curlymesquite	10
				Buffalograss	5
				Green sprangletop	5
				Texas needlegrass	5
				Texas cupgrass	5
				Tall dropseed	5
				Silver bluestem	5
				Live oak	5

See footnote at end of table.

TABLE 8.--RANGE PRODUCTIVITY AND COMPOSITION--Continued

Soil name and map symbol	Range site name	Potential production		Common plant name	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
Tarrant:					
[1]75:					
Tarrant part----	Low Stony Hills----------	Favorable	2,500	Little bluestem----------	15
		Normal	1,800	Sideoats grama----------	15
		Unfavorable	1,200	Curlymesquite----------	10
				Buffalograss----------	5
				Green sprangletop----------	5
				Texas needlegrass----------	5
				Texas cupgrass----------	5
				Tall dropseed----------	5
				Silver bluestem----------	5
				Live oak----------	5
Tarpley part----	Redland----------	Favorable	4,500	Little bluestem----------	25
		Normal	3,500	Indiangrass----------	15
		Unfavorable	2,500	Big bluestem----------	10
				Texas needlegrass----------	10
				Sideoats grama----------	5
				Tall dropseed----------	5
				Silver bluestem----------	5
				White shin oak----------	5
				Live oak----------	5
				Post oak----------	5
Throck:					
[1]76----------	Rocky Hills----------	Favorable	4,000	Sideoats grama----------	15
		Normal	3,000	Little bluestem----------	15
		Unfavorable	1,500	Texas cupgrass----------	10
				Hairy dropseed----------	10
				Indiangrass----------	5
				Buffalograss----------	5
				White tridens----------	5
				Texas needlegrass----------	5
Weswood:					
77----------	Loamy Bottomland----------	Favorable	6,000	Indiangrass----------	20
		Normal	5,000	Switchgrass----------	15
		Unfavorable	4,000	Big bluestem----------	10
				Little bluestem----------	10
				Canada wildrye----------	5
				Texas needlegrass----------	5
				Sideoats grama----------	5
				Vine-mesquite----------	5
Winters:					
78, 79, 80--------	Sandy Loam----------	Favorable	4,500	Little bluestem----------	20
		Normal	4,000	Indiangrass----------	10
		Unfavorable	2,000	Sideoats grama----------	10
				Post oak----------	5
				Blackjack oak----------	5
				Canada wildrye----------	5
				Buffalograss----------	5

[1]This map unit is made up of two or more dominant kinds of soil. See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Abilene:					
1, 2	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.
[1]3:					
Abilene part	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.
Urban land part.					
Bastrop:					
4	Slight	Slight	Slight	Slight	Moderate: low strength.
Bolar:					
5	Moderate: depth to rock.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.
[1]6:					
Bolar part	Moderate: depth to rock.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.
Brackett part	Moderate: depth to rock.	Moderate: depth to rock.	Moderate: depth to rock.	Moderate: depth to rock.	Moderate: depth to rock.
Bonti:					
7, 8	Severe: depth to rock.	Moderate: depth to rock, shrink-swell.	Severe: depth to rock.	Moderate: depth to rock.	Severe: low strength.
[1]9:					
Bonti part	Severe: depth to rock.	Moderate: depth to rock, shrink-swell.	Severe: depth to rock.	Moderate: depth to rock.	Severe: low strength.
Urban land part.					
[1]10:					
Bonti part	Severe: depth to rock.	Moderate: depth to rock, shrink-swell.	Moderate: depth to rock, shrink-swell.	Severe: large stones.	Severe: low strength.
Callahan part	Severe: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.
[1]11:					
Bonti part	Severe: depth to rock.	Moderate: depth to rock, shrink-swell.	Moderate: depth to rock, shrink-swell.	Severe: slope, large stones.	Severe: low strength.
Throck part	Severe: too clayey.	Moderate: slope, shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.
Bosque:					
12	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
Brackett:					
[1]13	Moderate: depth to rock.	Moderate: depth to rock.	Moderate: depth to rock.	Moderate: depth to rock.	Moderate: depth to rock.

See footnote at end of table.

TABLE 9.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Brackett:					
[1]14:					
Brackett part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Tarrant part	Severe: depth to rock.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.
Callahan:					
15, 16	Severe: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.
[1]17:					
Callahan part	Severe: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.
Urban land part.					
[1]18:					
Callahan part	Severe: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.
Throck part	Severe: too clayey.	Moderate: shrink-swell, large stones.	Moderate: shrink-swell, large stones.	Moderate: shrink-swell, large stones.	Severe: low strength.
Caradan:					
19	Severe: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
Chaney:					
20	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.
Cisco:					
21, 22, 23	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength.
Clairemont:					
[1]24	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
Deleon:					
25	Severe: too clayey.	Severe: floods, shrink-swell.	Severe: floods, shrink-swell.	Severe: floods, shrink-swell.	Severe: shrink-swell.
[1]26:					
Deleon part	Severe: too clayey.	Severe: floods, shrink-swell.	Severe: floods, shrink-swell.	Severe: floods, shrink-swell.	Severe: shrink-swell.
Urban land part.					
Denton:					
27	Severe: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
Desan:					
28	Severe: cutbanks cave.	Slight	Slight	Slight	Slight.
Doudle:					
[1]29:					
Doudle part	Moderate: depth to rock.	Slight	Moderate: depth to rock.	Moderate: slope.	Moderate: low strength.

See footnote at end of table.

TABLE 9.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Doudle:					
Real part	Severe: small stones.	Moderate: depth to rock, slope.	Moderate: depth to rock.	Moderate: depth to rock, slope.	Moderate: depth to rock.
Energy:					
30	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.
Frio:					
31	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods, low strength.
32	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods, low strength.
[1]33:					
Frio part	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods, low strength.
Urban land part.					
Heaton:					
34	Severe: cutbanks cave.	Slight	Slight	Slight	Slight.
Hext:					
35	Moderate: depth to rock.	Slight	Moderate: depth to rock.	Slight	Moderate: low strength.
36	Moderate: depth to rock.	Slight	Moderate: depth to rock.	Moderate: slope.	Moderate: low strength.
[1]37:					
Hext part	Moderate: depth to rock.	Slight	Moderate: depth to rock.	Moderate: slope.	Moderate: low strength.
Brackett part	Moderate: depth to rock.	Moderate: depth to rock.	Moderate: depth to rock.	Moderate: depth to rock.	Moderate: depth to rock.
Kavett:					
38	Severe: depth to rock, too clayey.	Severe: depth to rock, shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: depth to rock, low strength, shrink-swell.
Krum:					
39	Severe: cutbanks cave, too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
Leeray:					
40, 41	Severe: cutbanks cave, too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.
Lindy:					
42	Severe: depth to rock, too clayey.	Moderate: shrink-swell.	Severe: depth to rock.	Moderate: shrink-swell.	Severe: low strength.
May:					
43, 44	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength.

See footnote at end of table.

TABLE 9.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Menard:					
45, 47	Slight	Slight	Slight	Slight	Moderate: low strength.
46, 48	Slight	Slight	Slight	Moderate: slope.	Moderate: low strength.
[1]49:					
Menard part	Slight	Slight	Slight	Slight	Moderate: low strength.
Hext part	Moderate: depth to rock.	Slight	Moderate: depth to rock.	Slight	Moderate: low strength.
Mereta:					
50	Moderate: cemented pan.	Moderate: cemented pan, shrink-swell.	Moderate: cemented pan, shrink-swell.	Moderate: cemented pan, shrink-swell.	Moderate: cemented pan, shrink-swell.
Miller:					
51	Severe: floods, too clayey.	Severe: floods, shrink-swell, low strength.	Severe: floods, shrink-swell, low strength.	Severe: floods, shrink-swell, low strength.	Severe: low strength, shrink-swell.
Nimrod:					
52	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Slight.
Nukrum:					
53	Severe: cutbanks cave, too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
[1]54:					
Nukrum part	Severe: cutbanks cave, too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
Urban land part.					
Nuvalde:					
55	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
Patilo:					
56	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Slight.
Pedernales:					
57, 58, 59, 60	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, low strength.
Real:					
[1]61	Severe: small stones.	Moderate: depth to rock, slope.	Moderate: depth to rock, slope.	Severe: slope.	Moderate: depth to rock, slope.
[1]62:					
Real part	Severe: small stones, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Tarrant part	Severe: depth to rock.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.

See footnote at end of table.

TABLE 9.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Rochelle:					
63	Moderate: small stones.	Slight	Slight	Slight	Slight.
Rowena:					
64, 65	Severe: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
Sagerton:					
66, 67	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, shrink-swell.
168:					
Sagerton part	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, shrink-swell.
Urban land part.					
Speck:					
69	Severe: depth to rock.	Severe: depth to rock, shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: depth to rock, shrink-swell.
170:					
Speck part	Severe: depth to rock.	Severe: depth to rock, shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: depth to rock, shrink-swell.
Urban land part.					
171:					
Speck part	Severe: depth to rock.	Severe: depth to rock, shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: depth to rock, shrink-swell.
Tarrant part	Severe: depth to rock.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.
Sunev:					
72	Slight	Slight	Slight	Slight	Moderate: low strength.
Tarpley:					
73	Severe: depth to rock.	Severe: depth to rock, shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: depth to rock, shrink-swell.
174:					
Tarpley part	Severe: depth to rock.	Severe: depth to rock, shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: depth to rock, shrink-swell.
Tarrant part	Severe: depth to rock.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.
Tarrant:					
175:					
Tarrant part	Severe: depth to rock.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.
Tarpley part	Severe: depth to rock.	Severe: depth to rock, shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: depth to rock, shrink-swell.

See footnote at end of table.

TABLE 9.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Throck:					
[1]76	Severe: too clayey.	Moderate: slope, shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.
Weswood:					
77	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: low strength.
Winters:					
78, 79, 80	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.
[1]81:					
winters part	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.
Urban land part.					

[1]This map unit is made up of two or more dominant kinds of soil. See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms used to rate soils. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Abilene:					
1	Severe: percs slowly.	Slight	Moderate: too clayey.	Slight	Fair: too clayey.
2	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
[1]3:					
Abilene part	Severe: percs slowly.	Slight	Moderate: too clayey.	Slight	Fair: too clayey.
Urban land part.					
Bastrop:					
4	Moderate: percs slowly.	Moderate: seepage.	Slight	Slight	Good.
Bolar:					
5	Severe: depth to rock.	Severe: depth to rock.	Moderate: depth to rock.	Slight	Fair: too clayey.
[1]6:					
Bolar part	Severe: depth to rock.	Severe: depth to rock.	Moderate: depth to rock.	Slight	Fair: too clayey.
Brackett part	Severe: percs slowly, depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight	Poor: thin layer.
Bonti:					
7, 8	Severe: percs slowly, depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight	Fair: depth to rock.
[1]9:					
Bonti part	Severe: percs slowly, depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight	Fair: depth to rock.
Urban land part.					
[1]10:					
Bonti part	Severe: percs slowly, depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight	Poor: large stones.
Callahan part	Severe: percs slowly.	Moderate: large stones, slope.	Severe: too clayey, depth to rock.	Slight	Poor: thin layer, large stones.
[1]11:					
Bonti part	Severe: percs slowly, depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Moderate: slope.	Poor: large stones.
Throck part	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey.
Bosque:					
12	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Good.

See footnote at end of table.

TABLE 10.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Brackett:					
13	Severe: percs slowly, depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight	Poor: thin layer.
14:					
Brackett part	Severe: percs slowly, depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: slope.	Poor: thin layer.
Tarrant part	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: slope.	Poor: thin layer, large stones, too clayey.
Callanan:					
15, 16	Severe: percs slowly.	Moderate: slope.	Severe: too clayey, depth to rock.	Slight	Poor: thin layer.
17:					
Callahan part	Severe: percs slowly.	Moderate: slope.	Severe: too clayey, depth to rock.	Slight	Poor: thin layer.
Urban land part.					
18:					
Callahan part	Severe: percs slowly.	Moderate: large stones, slope.	Severe: too clayey, depth to rock.	Slight	Poor: thin layer, large stones.
Throck part	Severe: percs slowly.	Moderate: large stones.	Severe: too clayey.	Slight	Poor: too clayey.
Caradan:					
19	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey.
Chaney:					
20	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Poor: thin layer.
Cisco:					
21, 22, 23	Slight	Moderate: seepage, slope.	Severe: seepage.	Slight	Good.
Clairemont:					
24	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Good.
Deleon:					
25	Severe: percs slowly.	Moderate: excess humus.	Severe: too clayey.	Moderate: floods.	Poor: too clayey.
26:					
Deleon part	Severe: percs slowly.	Moderate: excess humus.	Severe: too clayey.	Moderate: floods.	Poor: too clayey.
Urban land part.					
Denton:					
27	Severe: percs slowly, depth to rock.	Severe: depth to rock.	Severe: too clayey, depth to rock.	Slight	Poor: too clayey.
Desan:					
28	Slight	Severe: seepage.	Moderate: too sandy.	Moderate: seepage.	Poor: too sandy.

See footnote at end of table.

TABLE 10.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Doudle:					
129:					
Doudle part	Moderate: depth to rock.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: thin layer.
Real part	Severe: depth to rock.	Severe: depth to rock, small stones.	Moderate: depth to rock.	Slight	Poor: small stones.
Energy:					
30	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Good.
Frio:					
31	Severe: floods, percs slowly.	Severe: floods.	Severe: floods.	Severe: floods.	Fair: too clayey.
32	Severe: floods, percs slowly.	Severe: floods.	Severe: floods.	Severe: floods.	Fair: too clayey.
133:					
Frio part	Severe: floods, percs slowly.	Severe: floods.	Severe: floods.	Severe: floods.	Fair: too clayey.
Urban land part.					
Heaton:					
34	Slight	Moderate: seepage.	Slight	Slight	Fair: too sandy.
Hext:					
35, 36	Moderate: depth to rock.	Moderate: seepage.	Moderate: depth to rock, seepage.	Slight	Fair: thin layer.
137:					
Hext part	Moderate: depth to rock.	Moderate: seepage.	Moderate: depth to rock, seepage.	Slight	Fair: thin layer.
Brackett part	Severe: percs slowly, depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight	Poor: thin layer.
Kavett:					
38	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Slight	Poor: thin layer, too clayey.
Krum:					
39	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey.
Leeray:					
40, 41	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey.
Lindy:					
42	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight	Fair: thin layer, too clayey.
May:					
43, 44	Slight	Moderate: seepage.	Slight	Slight	Good.

See footnote at end of table.

TABLE 10.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Menard: 45, 46, 47, 48	Slight	Moderate: seepage, slope.	Severe: seepage.	Slight	Good.
[1]49:					
Menard part	Slight	Moderate: seepage, slope.	Severe: seepage.	Slight	Good.
Hext part	Moderate: depth to rock.	Moderate: seepage.	Moderate: depth to rock, seepage.	Slight	Fair: thin layer.
Mereta: 50	Severe: cemented pan, percs slowly.	Severe: cemented pan.	Moderate: cemented pan.	Slight	Poor: thin layer.
Miller: 51	Severe: percs slowly, floods.	Severe: floods.	Severe: floods, too clayey.	Severe: floods.	Poor: too clayey, hard to pack.
Nimrod: 52	Severe: percs slowly.	Severe: seepage.	Moderate: wetness.	Severe: wetness.	Fair: too sandy.
Nukrum: 53	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey.
[1]54:					
Nukrum part	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey.
Urban land part.					
Nuvalde: 55	Moderate: percs slowly.	Moderate: slope, seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
Patilo: 56	Moderate: percs slowly.	Severe: seepage.	Moderate: too sandy, wetness.	Moderate: seepage.	Poor: too sandy.
Pedernales: 57, 58, 59, 60	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Real: [1]61	Severe: depth to rock.	Severe: depth to rock, small stones, slope.	Moderate: depth to rock.	Moderate: slope.	Poor: small stones.
[1]62:					
Real part	Severe: depth to rock, slope.		Moderate: depth to rock, slope.	Severe: slope.	Poor: small stones, slope.
Tarrant part	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: slope.	Poor: thin layer, large stones, too clayey.

See footnote at end of table.

TABLE 10.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Rochelle:					
63	Moderate: percs slowly.	Moderate: seepage.	Severe: seepage, small stones.	Slight	Fair: thin layer.
Rowena:					
64	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey.
65	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey.
Sagerton:					
66	Moderate: percs slowly.	Slight	Moderate: too clayey.	Slight	Fair: too clayey.
67	Moderate: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
[1]68:					
Sagerton part	Moderate: percs slowly.	Slight	Moderate: too clayey.	Slight	Fair: too clayey.
Urban land part.					
Speck:					
69	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock.	Slight	Poor: thin layer, area reclaim.
[1]70:					
Speck part	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock, large stones.	Slight	Poor: thin layer, area reclaim.
Urban land part.					
[1]71:					
Speck part	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock, large stones.	Slight	Poor: thin layer, area reclaim.
Tarrant part	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight	Poor: thin layer, large stones, too clayey.
Sunev:					
72	Slight	Severe: seepage.	Slight	Slight	Fair: excess lime.
Tarpley:					
73	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight	Poor: thin layer, too clayey.
[1]74:					
Tarpley part	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight	Poor: thin layer, too clayey.
Tarrant part	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight	Poor: thin layer, large stones, too clayey.

See footnote at end of table.

TABLE 10.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Tarrant:					
[1]75:					
Tarrant part	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight	Poor: thin layer, large stones, too clayey.
Tarpley part	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight	Poor: thin layer, too clayey.
Throck:					
[1]76	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey.
Weswood:					
77	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Good.
winters:					
78	Moderate: percs slowly.	Slight	Moderate: too clayey.	Slight	Fair: too clayey.
79, 80	Moderate: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
[1]81:					
Winters part	Moderate: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Urban land part.					

[1]This map unit is made up of two or more dominant kinds of soil. See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," and "unsuited." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Abilene:				
1, 2	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
[1]3:				
Abilene part	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
Urban land part.				
Bastrop:				
4	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Bolar:				
5	Poor: low strength, thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: excess lime.
[1]6:				
Bolar part	Poor: low strength, thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: large stones.
Brackett part	Poor: thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: excess lime.
Bonti:				
7, 8	Poor: thin layer, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
[1]9:				
Bonti part	Poor: thin layer, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Urban land part.				
[1]10:				
Bonti part	Poor: thin layer, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: large stones.
Callahan part	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer, large stones.
[1]11:				
Bonti part	Poor: thin layer, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: large stones.
Throck part	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey, large stones.
Bosque:				
12	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Brackett:				
[1]13	Poor: thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: excess lime.

See footnote at end of table.

TABLE 11.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Brackett:				
[1]14:				
Brackett part	Poor: thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: excess lime.
Tarrant part	Poor: thin layer, large stones.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer, large stones.
Callahan:				
15, 16	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer.
[1]17:				
Callahan part	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer.
Urban land part.				
[1]18:				
Callahan part	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer, large stones.
Throck part	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey, large stones.
Caradan:				
19	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer.
Chaney:				
20	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too sandy.
Cisco:				
21	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too sandy.
22, 23	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Clairemont:				
[1]24	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Deleon:				
25	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
[1]26:				
Deleon part	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
Urban land part.				
Denton:				
27	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
Desan:				
28	Good	Fair: excess fines.	Unsuited: excess fines.	Poor: too sandy.

See footnote at end of table.

TABLE 11.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Doudle:				
[1]29:				
Doudle part	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: excess lime, small stones.
Real part	Good	Unsuited: excess fines.	Poor: excess fines.	Poor: small stones.
Energy:				
30	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Frio:				
31, 32	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
[1]33:				
Frio part	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
Urban land part.				
Heaton:				
34	Good	Fair: excess fines.	Unsuited: excess fines.	Poor: too sandy.
Hext:				
35, 36	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: excess lime.
[1]37:				
Hext part	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: excess lime.
Brackett part	Poor: thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: excess lime.
Kavett:				
38	Poor: thin layer, shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
Krum:				
39	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
Leeray:				
40, 41	Poor: shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
Lindy:				
42	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
May:				
43, 44	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Menard:				
45, 46, 47, 48	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
[1]49:				
Menard part	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.

See footnote at end of table.

TABLE 11.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Menard:				
Hext part	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: excess lime.
Mereta:				
50	Fair: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: area reclaim.
Miller:				
51	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
Nimrod:				
52	Good	Poor: excess fines.	Unsuited: excess fines.	Poor: too sandy.
Nukrum:				
53	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
[1]54:				
Nukrum part	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
Urban land part.				
Nuvalde:				
55	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
Patilo:				
56	Good	Fair: excess fines.	Unsuited: excess fines.	Poor: too sandy.
Pedernales:				
57	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too sandy.
58, 59, 60	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Real:				
[1]61	Good	Unsuited: excess fines.	Poor: excess fines.	Poor: small stones.
[1]62:				
Real part	Fair: slope.	Unsuited: excess fines.	Poor: excess fines.	Poor: small stones, slope.
Tarrant part	Poor: thin layer, large stones.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer, large stones.
Rochelle:				
63	Good	Unsuited: excess fines.	Poor: excess fines.	Poor: thin layer.
Rowena:				
64, 65	Poor: low strength, shrink-swell.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.

See footnote at end of table.

TABLE 11.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Sagerton:				
66, 67	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
168:				
Sagerton part	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey.
Urban land part.				
Speck:				
69	Poor: thin layer, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer, area reclaim.
170:				
Speck part	Poor: thin layer, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer, large stones.
Urban land part.				
171:				
Speck part	Poor: thin layer, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer, large stones.
Tarrant part	Poor: thin layer, large stones.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer, large stones.
Sunev:				
72	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: excess lime.
Tarpley:				
73	Poor: thin layer, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer.
174:				
Tarpley part	Poor: low strength, thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: large stones, thin layer.
Tarrant part	Poor: thin layer, large stones.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer, large stones.
Tarrant:				
175:				
Tarrant part	Poor: thin layer, large stones.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer, large stones.
Tarpley part	Poor: low strength, thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: large stones, thin layer.
Throck:				
176	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey, large stones.
Weswood:				
77	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.

See footnote at end of table.

TABLE 11.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Winters: 78, 79, 80	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
[1]81: Winters part	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Urban land part.				

[1]This map unit is made up of two or more dominant kinds of soil. See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
Abilene:						
1, 2	Moderate: seepage.	Moderate: piping, compressible.	Not needed	Slow intake	Favorable	Favorable.
3:						
Abilene part	Moderate: seepage.	Moderate: piping, compressible.	Not needed	Slow intake	Favorable	Favorable.
Urban land part.						
Bastrop:						
4	Moderate: seepage.	Moderate: piping.	Not needed	Favorable	Favorable	Favorable.
Bolar:						
5	Severe: seepage.	Moderate: thin layer.	Depth to rock	Excess lime	Favorable	Favorable.
6:						
Bolar part	Severe: seepage.	Moderate: thin layer.	Depth to rock	Excess lime	Large stones	Large stones.
Brackett part	Severe: seepage.	Severe: thin layer.	Depth to rock	Droughty, excess lime, rooting depth.	Depth to rock, rooting depth.	Droughty, rooting depth.
Bonti:						
7, 8	Severe: depth to rock.	Moderate: thin layer.	Not needed	Slow intake	Favorable	Favorable.
9:						
Bonti part	Severe: depth to rock.	Moderate: thin layer.	Not needed	Slow intake	Favorable	Favorable.
Urban land part.						
10:						
Bonti part	Severe: depth to rock.	Severe: large stones.	Not needed	Slow intake, large stones.	Large stones	Large stones.
Callahan part	Slight	Moderate: compressible, large stones.	Not needed	Percs slowly	Percs slowly, large stones.	Percs slowly, large stones.
11:						
Bonti part	Severe: depth to rock.	Severe: large stones.	Not needed	Slow intake, large stones.	Large stones, slope.	Large stones, slope.
Tnrock part	Slight	Severe: large stones.	Not needed	Complex slope, slow intake.	Large stones	Large stones, percs slowly.
Bosque:						
12	Moderate: seepage.	Moderate: compressible.	Not needed	Favorable	Floods	Floods.
Brackett:						
13	Severe: seepage.	Severe: thin layer.	Depth to rock	Droughty, excess lime, rooting depth.	Depth to rock, rooting depth.	Droughty, rooting depth.
14:						
Brackett part	Severe: seepage.	Severe: thin layer.	Depth to rock	Droughty, excess lime, rooting depth.	Depth to rock, rooting depth.	Droughty, rooting depth.

See footnote at end of table.

TABLE 12.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
Brackett:						
Tarrant part---	Severe: depth to rock.	Severe: thin layer, large stones.	Depth to rock	Rooting depth	Depth to rock, large stones.	Rooting depth, large stones.
Callahan:						
15, 16----------	Slight---------	Moderate: compressible.	Not needed-----	Percs slowly---	Percs slowly---	Percs slowly.
[1]17:						
Callahan part--	Slight---------	Moderate: compressible.	Not needed-----	Percs slowly---	Percs slowly---	Percs slowly.
Urban land part.						
[1]18:						
Callahan part--	Slight---------	Moderate: compressible, large stones.	Not needed-----	Percs slowly---	Percs slowly, large stones.	Percs slowly, large stones.
Throck part----	Slight---------	Severe: large stones.	Not needed-----	Complex slope, slow intake.	Large stones---	Large stones, percs slowly.
Caradan:						
19----------	Moderate-------	Moderate: low strength.	Not needed-----	Slow intake, percs slowly.	Favorable------	Percs slowly.
Chaney:						
20----------	Slight---------	Moderate: erodes easily.	Percs slowly---	Percs slowly, soil blowing.	Piping, erodes easily.	Erodes easily.
Cisco:						
21----------	Moderate: seepage.	Moderate: erodes easily.	Not needed-----	Soil blowing, erodes easily.	Soil blowing, erodes easily.	Erodes easily.
22, 23----------	Moderate: seepage.	Moderate: erodes easily.	Not needed-----	Erodes easily	Erodes easily	Erodes easily.
Clairemont:						
[1]24----------	Moderate: seepage.	Moderate: piping, compressible.	Not needed-----	Floods---------	Not needed-----	Not needed.
Deleon:						
25----------	Slight---------	Moderate: compressible.	Percs slowly---	Slow intake, percs slowly.	Percs slowly---	Favorable.
[1]26:						
Deleon part----	Slight---------	Moderate: compressible.	Percs slowly---	Slow intake, percs slowly.	Percs slowly---	Favorable.
Urban land part.						
Denton:						
27----------	Severe: depth to rock.	Moderate: compressible, shrink-swell.	Not needed-----	Percs slowly---	Favorable------	Favorable.
Desan:						
28----------	Severe: seepage.	Moderate: seepage, piping.	Not needed-----	Fast intake, soil blowing.	Piping, erodes easily.	Droughty, erodes easily.
Doudle:						
[1]29:						
Doudle part----	Severe: seepage.	Moderate: thin layer, piping.	Not needed-----	Fast intake, excess lime.	Slope, erodes easily.	Slope, erodes easily.

See footnote at end of table.

TABLE 12.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
Doudle: Real part	Severe: depth to rock, seepage.	Severe: thin layer, seepage.	Not needed	Droughty, excess lime, seepage.	Not needed	Not needed.
Energy: 30	Severe: seepage.	Moderate: piping.	Not needed	Floods	Floods	Floods.
Frio: 31	Moderate: seepage.	Moderate: compressible.	Not needed	Floods	Favorable	Favorable.
32	Moderate: seepage.	Moderate: compressible.	Not needed	Floods	Favorable	Favorable.
[1]33: Frio part	Moderate: seepage.	Moderate: compressible.	Not needed	Floods	Favorable	Favorable.
Urban land part.						
Heaton: 34	Moderate: seepage.	Moderate: erodes easily.	Not needed	Fast intake, soil blowing.	Piping, erodes easily.	Droughty, erodes easily.
Hext: 35, 36	Severe: seepage.	Moderate: thin layer, piping.	Not needed	Erodes easily	Erodes easily	Erodes easily.
[1]37: Hext part	Severe: seepage.	Moderate: thin layer, piping.	Not needed	Erodes easily	Erodes easily	Erodes easily.
Brackett part	Severe: seepage.	Severe: thin layer.	Depth to rock	Droughty, excess lime, rooting depth.	Depth to rock, rooting depth.	Droughty, rooting depth.
Kavett: 38	Severe: depth to rock, seepage.	Severe: thin layer.	Not needed	Droughty, rooting depth.	Rooting depth	Rooting depth.
Krum: 39	Moderate: seepage.	Moderate: low strength.	Not needed	Slow intake	Percs slowly, erodes easily.	Percs slowly, erodes easily.
Leeray: 40, 41	Slight	Moderate: unstable fill.	Not needed	Slow intake, percs slowly.	Percs slowly	Percs slowly.
Lindy: 42	Severe: depth to rock.	Moderate: piping, thin layer.	Not needed	Rooting depth, slow intake.	Rooting depth	Rooting depth.
May: 43, 44	Moderate: seepage.	Moderate: erodes easily.	Not needed	Favorable	Favorable	Favorable.
Menard: 45, 46, 47, 48	Moderate: seepage.	Moderate: erodes easily.	Not needed	Erodes easily	Erodes easily	Erodes easily.
[1]49: Menard part	Moderate: seepage.	Moderate: erodes easily.	Not needed	Erodes easily	Erodes easily	Erodes easily.

See footnote at end of table.

TABLE 12.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
Menard:						
Hext part	Severe: seepage.	Moderate: thin layer, piping.	Not needed	Erodes easily	Erodes easily	Erodes easily.
Mereta:						
50	Severe: cemented pan.	Severe: thin layer.	Cemented pan	Rooting depth	Cemented pan, rooting depth.	Rooting depth, droughty.
Miller:						
51	Slight	Moderate: unstable fill, compressible.	Floods, percs slowly.	Floods, slow intake.	Not needed	Percs slowly.
Nimrod:						
52	Moderate: seepage.	Moderate: erodes easily.	Cutbanks cave	Fast intake, soil blowing.	Piping, erodes easily.	Erodes easily.
Nukrum:						
53	Moderate: seepage.	Moderate: low strength.	Not needed	Slow intake	Favorable	Favorable.
[1]54:						
Nukrum part	Moderate: seepage.	Moderate: low strength.	Not needed	Slow intake	Favorable	Favorable.
Urban land part.						
Nuvalde:						
55	Severe: seepage.	Moderate: compressible.	Not needed	Favorable	Favorable	Favorable.
Patilo:						
56	Severe: seepage.	Moderate: seepage, piping.	Cutbanks cave	Fast intake, soil blowing.	Piping, erodes easily.	Droughty.
Pedernales:						
57, 58, 59, 60	Moderate: seepage.	Moderate: compressible.	Percs slowly	Percs slowly	Favorable	Favorable.
Real:						
[1]61	Severe: depth to rock, seepage.	Severe: thin layer, seepage.	Not needed	Droughty, excess lime, seepage.	Not needed	Not needed.
[1]62:						
Real part	Severe: depth to rock, seepage.	Severe: thin layer, seepage.	Not needed	Droughty, excess lime, seepage.	Not needed	Not needed.
Tarrant part	Severe: depth to rock.	Severe: thin layer, large stones.	Depth to rock	Rooting depth	Depth to rock, large stones.	Rooting depth, large stones.
Rochelle:						
63	Severe: seepage.	Moderate: thin layer.	Not needed	Droughty	Favorable	Droughty.
Rowena:						
64, 65	Moderate: seepage.	Moderate: unstable fill.	Not needed	Favorable	Favorable	Favorable.
Sagerton:						
66, 67	Moderate: seepage.	Moderate: piping.	Not needed	Slow intake	Favorable	Favorable.
[1]68:						
Sagerton part	Moderate: seepage.	Moderate: piping.	Not needed	Slow intake	Favorable	Favorable.
Urban land part.						

See footnote at end of table.

TABLE 12.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
Speck: 69	Severe: depth to rock.	Severe: thin layer, low strength.	Not needed	Rooting depth	Depth to rock, rooting depth.	Rooting depth.
[1]70: Speck part	Severe: depth to rock.	Severe: thin layer, low strength.	Not needed	Rooting depth	Depth to rock, large stones.	Large stones, rooting depth.
Urban land part.						
[1]71: Speck part	Severe: depth to rock.	Severe: thin layer, low strength.	Not needed	Rooting depth	Depth to rock, large stones.	Large stones, rooting depth.
Tarrant part	Severe: depth to rock.	Severe: thin layer, large stones.	Depth to rock	Rooting depth	Depth to rock, large stones.	Rooting depth, large stones.
Sunev: 72	Severe: seepage.	Moderate: compressible, piping.	Not needed	Excess lime	Favorable	Favorable.
Tarpley: 73	Severe: depth to rock.	Severe: thin layer.	Not needed	Rooting depth, percs slowly.	Depth to rock	Rooting depth.
[1]74: Tarpley part	Severe: depth to rock.	Severe: thin layer.	Not needed	Rooting depth, percs slowly.	Depth to rock, large stones.	Rooting depth, large stones.
Tarrant part	Severe: depth to rock.	Severe: thin layer, large stones.	Depth to rock	Rooting depth	Depth to rock, large stones.	Rooting depth, large stones.
Tarrant: [1]75: Tarrant part	Severe: depth to rock.	Severe: thin layer, large stones.	Depth to rock	Rooting depth	Depth to rock, large stones.	Rooting depth, large stones.
Tarpley part	Severe: depth to rock.	Severe: thin layer.	Not needed	Rooting depth, percs slowly.	Depth to rock, large stones.	Rooting depth, large stones.
Throck: [1]76	Slight	Severe: large stones.	Not needed	Complex slope, slow intake.	Large stones	Large stones, percs slowly.
Weswood: 77	Moderate: seepage.	Moderate: piping, erodes easily.	Not needed	Floods	Favorable	Favorable.
Winters: 78, 79, 80	Moderate: seepage.	Moderate: compressible, piping.	Percs slowly	Slow intake, slope.	Favorable	Percs slowly.
[1]81: Winters part	Moderate: seepage.	Moderate: compressible, piping.	Percs slowly	Slow intake, slope.	Favorable	Percs slowly.
Urban land part.						

[1]This map unit is made up of two or more dominant kinds of soil. See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Abilene:				
1	Moderate: percs slowly.	Moderate: too clayey.	Moderate: percs slowly, too clayey.	Moderate: too clayey.
2	Moderate: percs slowly.	Moderate: too clayey.	Moderate: percs slowly, slope.	Moderate: too clayey.
13:				
Abilene part	Moderate: percs slowly.	Moderate: too clayey.	Moderate: percs slowly, too clayey.	Moderate: too clayey.
Urban land part.				
Bastrop:				
4	Slight	Slight	Moderate: slope.	Slight.
Bolar:				
5	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.
16:				
Bolar part	Moderate: large stones.	Moderate: large stones.	Severe: large stones.	Moderate: large stones.
Brackett part	Moderate: percs slowly.	Slight	Severe: depth to rock.	Slight.
Bonti:				
7, 8	Moderate: percs slowly.	Slight	Moderate: depth to rock, slope.	Slight.
19:				
Bonti part	Moderate: percs slowly.	Slight	Moderate: depth to rock, slope.	Slight.
Urban land part.				
110:				
Bonti part	Moderate: large stones.	Moderate: large stones.	Severe: large stones.	Moderate: large stones.
Callahan part	Severe: percs slowly.	Slight	Severe: percs slowly.	Slight.
111:				
Bonti part	Moderate: slope, large stones.	Moderate: slope, large stones.	Severe: slope, large stones.	Moderate: large stones.
Throck part	Moderate: too clayey, percs slowly.	Moderate: too clayey.	Severe: slope.	Moderate: too clayey, large stones.
Bosque:				
12	Severe: floods.	Moderate: floods.	Severe: floods.	Slight.
Brackett:				
113	Moderate: percs slowly.	Slight	Severe: depth to rock.	Slight.

See footnote at end of table.

TABLE 13.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Brackett:				
[1]14:				
Brackett part	Severe: slope.	Severe: slope.	Severe: depth to rock.	Moderate: slope.
Tarrant part	Severe: large stones, slope.	Severe: large stones, too clayey.	Severe: depth to rock, slope.	Severe: large stones, too clayey.
Callahan:				
15, 16	Severe: percs slowly.	Slight	Severe: percs slowly.	Slight.
[1]17:				
Callahan part	Severe: percs slowly.	Slight	Severe: percs slowly.	Slight.
Urban land part.				
[1]18:				
Callahan part	Severe: percs slowly.	Moderate: too clayey.	Severe: percs slowly.	Moderate: too clayey.
Throck part	Moderate: too clayey, percs slowly.	Moderate: too clayey.	Moderate: too clayey, large stones.	Moderate: too clayey, large stones.
Caradan:				
19	Severe: percs slowly.	Moderate: too clayey.	Severe: percs slowly.	Moderate: too clayey.
Chaney:				
20	Moderate: percs slowly.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.
Cisco:				
21	Moderate: too sandy.	Moderate: too sandy.	Severe: soil blowing.	Moderate: too sandy.
22, 23	Slight	Slight	Moderate: slope.	Slight.
Clairemont:				
[1]24	Severe: floods.	Moderate: dusty, floods.	Moderate: dusty, floods.	Slight.
Deleon:				
25	Severe: too clayey, floods.	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.
[1]26:				
Deleon part	Severe: too clayey, floods.	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.
Urban land part.				
Denton:				
27	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.
Desan:				
28	Severe: too sandy.	Severe: too sandy.	Severe: too sandy, soil blowing.	Severe: too sandy.

See footnote at end of table.

TABLE 13.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Doudle:				
[1]29:				
Doudle part	Slight	Slight	Moderate: small stones.	Slight.
Real part	Moderate: small stones.	Moderate: small stones.	Moderate: small stones, slope.	Moderate: small stones.
Energy:				
30	Severe: floods.	Moderate: floods.	Moderate: floods.	Slight.
Frio:				
31	Severe: floods.	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.
32	Severe: floods.	Moderate: too clayey.	Severe: floods.	Moderate: too clayey.
[1]33:				
Frio part	Severe: floods.	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.
Urban land part.				
Heaton:				
34	Moderate: too sandy.	Moderate: too sandy.	Severe: soil blowing, too sandy.	Moderate: too sandy.
Hext:				
35, 36	Slight	Slight	Moderate: depth to rock, slope.	Slight.
[1]37:				
Hext part	Slight	Slight	Moderate: depth to rock, slope.	Slight.
Brackett part	Moderate: percs slowly.	Slight	Severe: depth to rock.	Slight.
Kavett:				
38	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.
Krum:				
39	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.
Leeray:				
40, 41	Severe: too clayey, percs slowly.	Severe: too clayey.	Severe: too clayey, percs slowly.	Severe: too clayey.
Lindy:				
42	Moderate: percs slowly.	Moderate: too clayey.	Moderate: depth to rock.	Moderate: too clayey.
May:				
43, 44	Slight	Slight	Slight	Slight.
Menard:				
45, 46, 47	Slight	Slight	Moderate: slope.	Slight.

See footnote at end of table.

TABLE 13.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Menard:				
48	Slight	Slight	Severe: slope.	Slight.
1 49:				
Menard part	Slight	Slight	Moderate: slope.	Slight.
Hext part	Slight	Slight	Moderate: depth to rock, slope.	Slight.
Mereta:				
50	Moderate: percs slowly, too clayey.	Moderate: too clayey.	Severe: cemented pan.	Moderate: too clayey.
Miller:				
51	Severe: floods, percs slowly, too clayey.	Severe: too clayey.	Severe: percs slowly.	Severe: too clayey.
Nimrod:				
52	Severe: too sandy, soil blowing.	Severe: too sandy, soil blowing.	Severe: too sandy, soil blowing.	Severe: too sandy.
Nukrum:				
53	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.
1 54:				
Nukrum part	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.
Urban land part.				
Nuvalde:				
55	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.
Patilo:				
56	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
Pedernales:				
57	Moderate: percs slowly.	Moderate: too sandy.	Moderate: percs slowly, too sandy.	Moderate: too sandy.
58, 59, 60	Moderate: percs slowly.	Slight	Moderate: percs slowly.	Slight.
Real:				
1 61	Moderate: small stones, slope.	Moderate: small stones, slope.	Severe: slope.	Moderate: small stones.
1 62:				
Real part	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: small stones, slope.
Tarrant part	Severe: large stones, slope.	Severe: large stones, too clayey.	Severe: depth to rock, slope.	Severe: large stones, too clayey.

See footnote at end of table.

TABLE 13.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Rochelle:				
63	Slight	Slight	Moderate: slope.	Slight.
Rowena:				
64, 65	Moderate: percs slowly.	Moderate: too clayey.	Moderate: too clayey, percs slowly.	Moderate: too clayey.
Sagerton:				
66	Moderate: percs slowly.	Moderate: too clayey.	Moderate: percs slowly.	Moderate: too clayey.
67	Moderate: percs slowly.	Moderate: too clayey.	Moderate: slope, percs slowly.	Moderate: too clayey.
[1]68:				
Sagerton part	Moderate: percs slowly.	Moderate: too clayey.	Moderate: percs slowly.	Moderate: too clayey.
Urban land part.				
Speck:				
69	Moderate: percs slowly.	Moderate: too clayey.	Severe: depth to rock.	Moderate: too clayey.
[1]70:				
Speck part	Moderate: percs slowly, large stones.	Moderate: large stones.	Severe: depth to rock, large stones.	Moderate: large stones.
Urban land part.				
[1]71:				
Speck part	Moderate: percs slowly, large stones.	Moderate: large stones.	Severe: depth to rock, large stones.	Moderate: large stones.
Tarrant part	Severe: large stones, too clayey.	Severe: large stones, too clayey.	Severe: depth to rock, large stones.	Severe: large stones, too clayey.
Sunev:				
72	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey, slope.	Moderate: too clayey.
Tarpley:				
73	Severe: too clayey.	Severe: too clayey.	Severe: depth to rock.	Severe: too clayey.
[1]74:				
Tarpley part	Severe: too clayey.	Severe: too clayey.	Severe: depth to rock.	Severe: too clayey.
Tarrant part	Severe: large stones, too clayey.	Severe: large stones, too clayey.	Severe: depth to rock, large stones.	Severe: large stones, too clayey.
Tarrant:				
[1]75:				
Tarrant part	Severe: large stones, too clayey.	Severe: large stones, too clayey.	Severe: depth to rock, large stones.	Severe: large stones, too clayey.
Tarpley part	Severe: too clayey.	Severe: too clayey.	Severe: depth to rock.	Severe: too clayey.

See footnote at end of table.

TABLE 13.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Throck:				
[1]76	Moderate: too clayey, percs slowly.	Moderate: too clayey.	Severe: slope.	Moderate: too clayey, large stones.
Weswood:				
77	Severe: floods.	Severe: floods.	Moderate: floods.	Slight.
Winters:				
78, 79, 80	Moderate: percs slowly.	Slight	Moderate: percs slowly.	Slight.
[1]81:				
Winters part	Moderate: percs slowly.	Slight	Moderate: percs slowly.	Slight.
Urban land part.				

[1]This map unit is made up of two or more dominant kinds of soil. See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--WILDLIFE HABITAT

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements						Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Wetland wildlife	Rangeland wildlife
Abilene:									
1, 2	Good	Good	Fair	Good	Poor	Very poor.	Good	Very poor.	Fair.
[1]3:									
Abilene part	Good	Good	Fair	Good	Poor	Very poor.	Good	Very poor.	Fair.
Urban land part.									
Bastrop:									
4	Good	Good	Good	Good	Poor	Very poor.	Good	Very poor.	Good.
Bolar:									
5	Fair	Good	Fair	Fair	Poor	Very poor.	Fair	Very poor.	Fair.
[1]6:									
Bolar part	Poor	Poor	Fair	Fair	Poor	Very poor.	Poor	Very poor.	Fair.
Brackett part.									
Bonti:									
7	Good	Good	Good	Good	Poor	Very poor.	Good	Very poor.	Good.
8	Fair	Good	Good	Good	Poor	Very poor.	Good	Very poor.	Good.
[1]9:									
Bonti part	Fair	Good	Good	Good	Poor	Very poor.	Good	Very poor.	Good.
Urban land part.									
[1]10:									
Bonti part	Poor	Poor	Good	Good	Poor	Very poor.	Fair	Very poor.	Good.
Callahan part	Poor	Fair	Fair	Fair	Poor	Very poor.	Fair	Very poor.	Fair.
[1]11:									
Bonti part	Very poor.	Very poor.	Good.	Good	Poor	Very poor.	Poor	Very poor.	Good.
Throck part	Very poor.	Very poor.	Fair	Fair	Very poor.	Very poor.	Poor	Very poor.	Fair.
Bosque:									
12	Good	Good	Good	Good	Poor	Very poor.	Good	Very poor.	Good.
Brackett:									
[1]13	Poor	Poor	Fair	Fair	Poor	Very poor.	Poor	Very poor.	Fair.
[1]14:									
Brackett part	Very poor.	Very poor.	Fair	Fair	Very poor.	Very poor.	Very poor.	Very poor.	Fair.

See footnote at end of table.

TABLE 14.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements						Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Wetland wildlife	Rangeland wildlife
Brackett:									
Tarrant part----	Very poor.	Very poor.	Fair	Fair	Very poor.	Very poor.	Poor	Very poor.	Fair.
Callahan:									
15, 16----------	Fair	Good	Fair	Fair	Poor	Very poor.	Fair	Very poor.	Fair.
[1]17:									
Callahan part---	Fair	Good	Fair	Fair	Poor	Very poor.	Fair	Very poor.	Fair.
Urban land part.									
[1]18:									
Callahan part---	Poor	Fair	Fair	Fair	Poor	Very poor.	Fair	Very poor.	Fair.
Throck part-----	Poor	Poor	Fair	Fair	Poor	Very poor.	Poor	Very poor.	Fair.
Caradan:									
19----------	Fair	Fair	Fair	Fair	Poor	Very poor.	Fair	Very poor.	Fair.
Chaney:									
20----------	Fair	Good	Good	Good	Poor	Very poor.	Good	Very poor.	Good.
Cisco:									
21----------	Fair	Good	Good	Good	Poor	Very poor.	Good	Very poor.	Good.
22----------	Good	Good	Good	Good	Poor	Very poor.	Good	Very poor.	Good.
23----------	Fair	Good	Good	Good	Poor	Very poor.	Good	Very poor.	Good.
Clairemont:									
[1]24----------	Very poor.	Poor	Fair	Good	Very poor.	Very poor.	Poor	Very poor.	Fair.
Deleon:									
25----------	Good	Good	Fair	Fair	Poor	Poor	Fair	Poor	Fair.
[1]26:									
Deleon part-----	Good	Good	Fair	Fair	Poor	Poor	Fair	Poor	Fair.
Urban land part.									
Denton:									
27----------	Good	Good	Fair	Fair	Poor	Very poor.	Fair	Very poor.	Fair.
Desan:									
28----------	Fair	Good	Fair	Fair	Poor	Very poor.	Fair	Very poor.	Fair.
Doudle:									
[1]29:									
Doudle part-----	Poor	Poor	Good	Good	Very poor.	Very poor.	Fair	Very poor.	Good.
Real part-------	Very poor.	Poor	Poor	Fair	Poor	Very poor.	Poor	Very poor.	Poor.

See footnote at end of table.

TABLE 14.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements						Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Wetland wildlife	Rangeland wildlife
Energy:									
30	Good	Good	Good	Good	Poor	Very poor.	Good	Very poor.	Good.
Frio:									
31	Good	Good	Fair	Good	Poor	Very poor.	Good	Very poor.	Fair.
32	Very poor.	Poor	Fair	Good	Poor	Very poor.	Poor	Very poor.	Fair.
[1]33:									
Frio part	Good	Good	Fair	Good	Poor	Very poor.	Good	Very poor.	Fair.
Urban land part.									
Heaton:									
34	Fair	Good	Good	Good	Poor	Very poor.	Good	Very poor.	Good.
Hext:									
35, 36	Fair	Good	Good	Good	Poor	Very poor.	Good	Very poor.	Good.
[1]37:									
Hext part	Fair	Good	Good	Good	Poor	Very poor.	Good	Very poor.	Good.
Brackett part	Fair	Good	Fair	Fair	Poor	Very poor.	Fair	Very poor.	Fair.
Kavett:									
38	Fair	Fair	Fair	Poor	Poor	Very poor.	Fair	Very poor.	Poor.
Krum:									
39	Good	Good	Fair	Fair	Poor	Very poor.	Good	Very poor.	Fair.
Leeray:									
40, 41	Fair	Fair	Fair	Fair	Poor	Very poor.	Fair	Very poor.	Fair.
Lindy:									
42	Fair	Good	Good	Good	Very poor.	Very poor.	Good	Very poor.	Good.
May:									
43, 44	Good	Good	Good	Good	Poor	Very poor.	Good	Very poor.	Good.
Menard:									
45	Good	Good	Good	Good	Poor	Very poor.	Good	Very poor.	Good.
46, 47, 48	Fair	Good	Good	Good	Poor	Very poor.	Good	Very poor.	Good.
[1]49:									
Menard part	Fair	Good	Good	Good	Poor	Very poor.	Good	Very poor.	Good.
Hext part	Fair	Good	Good	Good	Poor	Very poor.	Good	Very poor.	Good.
Mereta:									
50	Fair	Fair	Fair	Fair	Poor	Very poor.	Fair	Very poor.	Fair.

See footnote at end of table.

TABLE 14.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements						Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Wetland wildlife	Rangeland wildlife
Miller:									
51	Fair	Fair	Fair	Poor	Poor	Poor	Fair	Poor	Poor.
Nimrod:									
52	Fair	Good	Good	Good	Poor	Very poor.	Good	Very poor.	Good.
Nukrum:									
53	Good	Good	Fair	Fair	Poor	Very poor.	Good	Very poor.	Fair.
[1]54:									
Nukrum part	Good	Good	Fair	Fair	Poor	Very poor.	Good	Very poor.	Fair.
Urban land part.									
Nuvalde:									
55	Good	Good	Fair	Fair	Poor	Very poor.	Good	Very poor.	Fair.
Patilo:									
56	Fair	Good	Fair	Fair	Poor	Very poor.	Fair	Very poor.	Fair.
Pedernales:									
57	Fair	Good	Good	Good	Poor	Very poor.	Good	Very poor.	Good.
58	Good	Good	Good	Good	Poor	Very poor.	Good	Very poor.	Good.
59	Fair	Good	Good	Good	Poor	Very poor.	Good	Very poor.	Good.
60	Fair	Good	Good	Good	Poor	Very poor.	Good	Very poor.	Good.
Real:									
[1]61	Very poor.	Very poor.	Poor	Fair	Very poor.	Very poor.	Very poor.	Very poor.	Poor.
[1]62:									
Real part	Very poor.	Very poor.	Poor	Fair	Very poor.	Very poor.	Very poor.	Very poor.	Poor.
Tarrant part	Very poor.	Very poor.	Fair	Fair	Very poor.	Very poor.	Poor	Very poor.	Fair.
Rochelle:									
63	Fair	Fair	Good	Good	Poor	Very poor.	Fair	Very poor.	Good.
Rowena:									
64, 65	Good	Good	Fair	Fair	Poor	Very poor.	Good	Very poor.	Fair.
Sagerton:									
66, 67	Good	Good	Fair	Good	Very poor.	Very poor.	Good	Very poor.	Fair.
Sagerton:									
[1]68:									
Sagerton part	Good	Good	Fair	Good	Very poor.	Very poor.	Good	Very poor.	Fair.
Urban land part.									

See footnote at end of table.

TABLE 14.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements						Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Wetland wildlife	Rangeland wildlife
Speck: 69	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Very poor.	Fair.
[1]70: Speck part	Poor	Poor	Fair	Good	Very poor.	Very poor.	Poor	Very poor.	Fair.
Urban land part.									
[1]71: Speck part	Poor	Poor	Fair	Good	Very poor.	Very poor.	Poor	Very poor.	Fair.
Tarrant part	Very poor.	Very poor.	Fair	Fair	Very poor.	Very poor.	Poor	Very poor.	Fair.
Sunev: 72	Good	Good	Good	Good	Poor	Very poor.	Good	Very poor.	Good.
Tarpley: 73	Fair	Fair	Fair	Fair	Poor	Very poor.	Fair	Very poor.	Fair.
[1]74: Tarpley part	Poor	Poor	Fair	Good	Poor	Very poor.	Poor	Very poor.	Fair.
Tarrant part	Very poor.	Very poor.	Fair	Fair	Very poor.	Very poor.	Poor	Very poor.	Fair.
Tarrant: [1]75: Tarrant part	Very poor.	Very poor.	Fair	Fair	Very poor.	Very poor.	Poor	Very poor.	Fair.
Tarpley part	Poor	Poor	Fair	Good	Poor	Very poor.	Poor	Very poor.	Fair.
Throck: [1]76	Very poor.	Very poor.	Fair	Fair	Very poor.	Very poor.	Poor	Very poor.	Fair.
Weswood: 77	Good	Good	Fair	Good	Poor	Very poor.	Good	Very poor.	Fair.
Winters: 78	Good	Good	Good	Good	Poor	Very poor.	Good	Very poor.	Good.
79, 80	Fair	Good	Good.	Good	Poor	Very poor.	Good	Very poor.	Good.
[1]81: Winters part	Fair	Good	Good	Good	Poor	Very poor.	Good	Very poor.	Good.
Winters: Urban land part.									

[1]This map unit is made up of two or more dominant kinds of soil. See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--ENGINEERING INDEX PROPERTIES

[The symbol < means less than; > means more than. Absence of an entry means data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Abilene:											
1, 2	0-10	Clay loam	CL	A-4, A-6	0	95-100	95-100	90-100	60-96	25-35	8-16
	10-42	Clay loam, silty clay loam, clay.	CL, CH	A-7, A-6	0	95-100	95-100	90-100	75-95	34-58	22-40
	42-64	Clay loam, clay, silty clay loam.	CL	A-6, A-7	0	90-100	88-100	80-98	60-95	35-50	19-32
[1]3:											
Abilene part	0-10	Clay loam	CL	A-4, A-6	0	95-100	95-100	90-100	60-96	25-35	8-16
	10-42	Clay loam, silty clay loam, clay.	CL, CH	A-7	0	95-100	95-100	90-100	75-95	34-58	22-40
	42-64	Clay loam, clay, silty clay loam.	CL	A-6, A-7	0	90-100	88-100	80-98	60-95	35-50	19-32
Urban land part.											
Bastrop:											
4	0-18	Fine sandy loam	ML, SM, CL-ML, SM-SC	A-4	0	95-100	80-100	80-100	36-70	18-25	2-7
	18-80	Sandy clay loam, clay loam, loam.	CL, SC	A-6	0	95-100	80-100	80-100	40-70	26-40	11-22
Bolar:											
5	0-12	Clay loam	CL, SC	A-6, A-7, A-4	0-5	75-100	75-100	70-98	40-80	25-42	9-25
	12-30	Clay loam, loam, silty clay loam.	CL, SC	A-6, A-7	0-10	75-95	75-95	70-90	40-75	25-42	11-25
	30-36	Weathered bedrock.	---	---	---	---	---	---	---	---	---
[1]6:											
Bolar part	0-12	Stony clay loam	CL, SC	A-6, A-7, A-4	8-20	75-90	75-90	70-85	36-65	25-42	9-25
	12-30	Clay loam, loam, silty clay loam.	CL, SC	A-6, A-7	0-10	75-95	75-95	70-90	40-75	25-42	11-25
	30-36	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Brackett part	0-17	Gravelly loam	CL, SC	A-6	0-20	70-100	60-100	55-95	40-85	28-40	10-20
	17-41	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Bonti:											
7, 8	0-11	Fine sandy loam	SM, SM-SC, ML, CL-ML	A-4, A-2-4	0-2	90-100	90-100	70-100	25-70	18-30	2-7
	11-38	Clay, clay loam, sandy clay.	CL	A-6, A-7	0-4	80-100	80-100	70-100	51-75	30-45	18-25
	38-40	Weathered bedrock.	---	---	---	---	---	---	---	---	---
[1]9:											
Bonti part	0-11	Fine sandy loam	SM, SM-SC, ML, CL-ML	A-4, A-2-4	0-2	90-100	90-100	70-100	25-70	18-30	2-7
	11-38	Clay, clay loam, sandy clay.	CL	A-6, A-7	0-4	80-100	80-100	70-100	51-75	30-45	18-25
	38-40	Weathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Bonti:											
Urban land part.											
[1]10:											
Bonti part------	0-11	Stony fine sandy loam.	SM, SM-SC, ML, CL-ML	A-4, A-2-4	8-25	75-90	75-90	55-90	30-55	18-30	2-7
	11-38	Clay, clay loam, sandy clay.	CL	A-6, A-7	0-4	80-100	80-100	70-100	51-75	30-45	18-25
	38-40	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Callahan part---	0-4	Stony loam------	CL, CL-ML, SC, SM-SC	A-4, A-6	10-25	85-100	85-100	75-100	45-80	25-35	7-16
	4-38	Clay, clay loam	CL	A-6, A-7-6	0-5	90-100	90-100	80-100	60-95	35-50	19-30
	38-65	Shaly clay, weathered bedrock.	---	---	---	---	---	---	---	---	---
[1]11:											
Bonti part------	0-11	Stony fine sandy loam.	SM, SM-SC, ML, CL-ML	A-4, A-2-4	8-25	75-90	75-90	55-90	30-55	18-30	2-7
	11-38	Clay, clay loam, sandy clay.	CL	A-6, A-7	0-4	80-100	80-100	70-100	51-75	30-45	18-25
	38-40	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Throck part-----	0-8	Stony clay------	CL	A-6, A-7	5-30	70-90	70-90	60-90	51-85	30-45	18-28
	8-32	Gravelly clay, gravelly silty clay, clay.	CL, SC	A-6, A-7	0-5	55-99	55-99	50-99	40-90	35-48	20-30
	32-60	Clay, silty clay loam, shaly clay.	CL	A-6, A-7	0	95-100	95-100	90-100	75-95	30-50	14-30
Bosque:											
12----------	0-26	Loam----------	CL, CL-ML	A-4, A-6	0	100	95-100	80-100	55-95	24-40	7-22
	26-48	Loam, clay loam	CL	A-4, A-6, A-7-6	0	100	95-100	95-100	55-80	26-45	10-25
	48-64	Loam, clay loam, clay.	CL, CL-ML	A-4, A-6, A-7-6	0	98-100	95-100	80-100	55-95	24-45	7-25
Brackett:											
[1]13----------	0-17	Gravelly clay loam.	CL, SC	A-6	0-20	70-100	60-100	55-95	40-85	28-40	10-20
	17-41	Weathered bedrock.	---	---	---	---	---	---	---	---	---
[1]14:											
Brackett part---	0-17	Gravelly clay loam.	CL, SC	A-6	0-20	70-100	60-100	55-95	40-85	28-40	10-20
	17-41	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Tarrant part----	0-15	Cobbly clay-----	CH, GC	A-7-6	33-77	55-100	51-100	51-95	45-95	55-76	31-49
	15-20	Indurated, unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Callahan:											
15, 16	0-4	Loam	CL, CL-ML, SC, SM-SC	A-4, A-6	0	85-100	85-100	75-100	45-80	25-35	7-16
	4-38	Clay, clay loam	CL	A-6, A-7-6	0	90-100	90-100	80-100	60-95	35-50	19-30
	38-65	Shaly clay, weathered bedrock.	---	---	---	---	---	---	---	---	---
[1]17:											
Callahan part	0-4	Loam	CL, CL-ML, SC, SM-SC	A-4, A-6	0	85-100	85-100	75-100	45-80	25-35	7-16
	4-38	Clay, clay loam	CL	A-6, A-7-6	0	90-100	90-100	80-100	60-95	35-50	19-30
	38-65	Shaly clay, weathered bedrock.	---	---	---	---	---	---	---	---	---
Urban land part.											
[1]18:											
Callahan part	0-4	Stony clay loam	CL, CL-ML, SC, SM-SC	A-4, A-6	10-25	85-100	85-100	75-100	45-80	25-35	7-16
	4-38	Clay, clay loam	CL	A-6, A-7-6	0-5	90-100	90-100	80-100	60-95	35-50	19-30
	38-65	Shaly clay, weathered bedrock.	---	---	---	---	---	---	---	---	---
Throck part	0-8	Stony clay	CL	A-6, A-7	5-30	70-90	70-90	60-90	51-85	30-45	18-28
	8-32	Gravelly clay, gravelly silty clay, clay.	CL, SC	A-6, A-7	0-5	55-99	55-99	50-99	40-90	35-48	20-30
	32-60	Clay, silty clay loam, shaly clay.	CL	A-6, A-7	0	95-100	95-100	90-100	75-95	30-50	14-30
Caradan:											
19	0-4	Clay loam	CL, CH	A-7-6	0-5	83-100	80-100	75-100	70-95	44-60	22-36
	4-25	Clay	CH	A-7-6, A-7-5	0-5	90-100	90-100	80-100	75-100	70-85	40-54
	25-36	Clay loam, clay	CH, CL	A-7-6	0-5	90-100	90-100	80-100	75-100	45-60	22-36
	36-62	Silt loam, clay loam, silty clay loam.	CL	A-4, A-6, A-7-6	0-5	90-100	90-100	80-100	65-95	30-45	10-22
Chaney:											
20	0-18	Loamy fine sand	SM, SM-SC, SP-SM	A-2-4, A-4, A-3	0	80-100	80-100	65-98	7-45	<25	NP-4
	18-44	Clay, sandy clay	CL, CH	A-7-6	0	90-100	90-100	90-100	51-85	42-60	24-42
	44-54	Clay, sandy clay loam, sandy clay.	CL, CH, SC, SM-SC	A-6, A-7-6, A-2	0	90-100	90-100	80-100	25-85	25-60	6-40
Cisco:											
21	0-8	Loamy fine sand	SM, SM-SC	A-4, A-2-4	0	95-100	95-100	80-100	15-45	<25	NP-4
	8-46	Sandy clay loam, clay loam.	SC, CL	A-6	0	95-100	95-100	85-100	40-60	25-40	11-25
	46-63	Sandy clay loam, fine sandy loam.	SC, CL	A-4, A-6	0	95-100	95-100	85-95	40-60	20-35	8-20

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Cisco:											
22, 23----------	0-8	Fine sandy loam	SM, SM-SC, CL-ML, ML	A-4	0	95-100	95-100	90-100	40-55	<26	NP-7
	8-46	Sandy clay loam, clay loam.	SC, CL	A-6	0	95-100	95-100	82-100	40-60	25-40	11-25
	46-63	Sandy clay loam, fine sandy loam.	SC, CL	A-4, A-6	0	95-100	95-100	85-95	40-60	20-35	8-20
Clairemont:											
[1]24----------	0-62	Silt loam-------	CL, ML, CL-ML	A-4, A-6	0	100	98-100	95-100	51-95	25-40	7-20
Deleon:											
25----------	0-66	Silty clay------	CH, CL	A-7	0	95-100	95-100	95-100	85-100	41-60	25-35
	66-80	Clay, silty clay, silty clay loam.	CH, CL	A-7, A-6	0	95-100	95-100	90-100	85-100	35-60	20-35
[1]26:											
Deleon part-----	0-66	Silty clay------	CH, CL	A-7	0	95-100	95-100	95-100	85-100	41-60	25-35
	66-80	Clay, silty clay, silty clay loam.	CH, CL	A-7, A-6	0	95-100	95-100	90-100	85-100	35-60	20-35
Urban land part.											
Denton:											
27----------	0-16	Silty clay------	CH, MH	A-7	0-10	80-100	80-100	80-100	75-95	51-70	26-45
	16-28	Silty clay, clay, silty clay loam.	CH, CL, MH	A-7	0-20	80-100	80-100	80-100	70-95	41-60	21-40
	28-36	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Desan:											
28----------	0-54	Loamy fine sand	SM, SP-SM, SM-SC	A-2-4, A-3	0	98-100	95-100	85-100	8-28	<25	NP-5
	54-80	Sandy clay loam, fine sandy loam.	SC	A-2, A-4, A-6	0	98-100	95-100	90-100	25-50	20-36	8-20
Doudle:											
[1]29:											
Doudle part-----	0-6	Cobbly loam-----	CL, CL-ML, SC, SM-SC	A-6, A-4	15-30	80-100	75-100	70-95	40-75	25-35	7-16
	6-36	Loam, silt loam, very fine sandy loam.	CL, CL-ML	A-4, A-6	0-15	85-100	80-100	70-95	51-80	23-35	6-15
	36-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Real part-------	0-11	Gravelly clay loam.	GC, SC, GP-GM, SP-SM	A-2-6, A-2-4	1-10	25-75	10-50	10-45	10-35	25-35	8-15
	11-24	Variable, weathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Energy:											
30	0-8	Fine sandy loam	CL, ML, SM, SC	A-4, A-6	0	95-100	95-100	80-100	40-75	<30	NP-16
	8-48	Stratified clay loam to fine sandy loam.	CL, SC	A-4, A-6	0	95-100	95-100	80-100	40-95	20-40	8-25
	48-80	Stratified clay loam to fine sandy loam.	CL, SC	A-4, A-6	0	95-100	95-100	80-100	40-95	20-40	8-25
Frio:											
31, 32	0-34	Silty clay loam	CL, CH	A-6, A-7	0-2	80-100	80-100	70-100	60-95	35-52	20-34
	34-72	Silty clay, clay loam, gravelly clay loam.	CL, CH	A-6, A-7	0-2	65-100	65-100	60-100	55-95	35-52	20-34
[1]33:											
Frio part	0-34	Silty clay loam	CL, CH	A-6, A-7	0-2	80-100	80-100	70-100	60-95	35-52	20-34
	34-72	Silty clay, clay loam, gravelly clay loam.	CL, CH	A-6, A-7	0-2	65-100	65-100	60-100	55-95	35-52	20-34
Urban land part.											
Heaton:											
34	0-30	Loamy fine sand	SM	A-2-4	0	95-100	95-100	70-90	15-30	<25	NP-3
	30-55	Sandy clay loam	SC, SM-SC	A-2-4, A-4, A-6, A-2-6	0	98-100	95-100	75-90	25-45	20-35	4-15
	55-80	Sandy clay loam, fine sandy loam.	SC, SM-SC	A-2-4, A-4, A-6, A-2-6	0	98-100	95-100	75-90	25-45	20-30	4-15
Hext:											
35, 36	0-7	Loam	SM, SM-SC, SC, CL-ML	A-4	0-2	85-100	80-100	60-90	40-70	<25	NP-8
	7-24	Fine sandy loam, loam, sandy clay loam.	CL, SC, SM-SC, CL-ML	A-4, A-2-4	0-2	75-100	70-100	50-90	30-70	<30	NP-10
	24-38	Weathered bedrock.	---	---	---	---	---	---	---	---	---
[1]37:											
Hext part	0-7	Loam	SM, SM-SC, SC, CL-ML	A-4	0-2	85-100	80-100	60-90	40-70	<25	NP-8
	7-24	Fine sandy loam, loam, sandy clay loam.	CL, SC, SM-SC, CL-ML	A-4, A-2-4	0-2	75-100	70-100	50-90	30-70	<30	NP-10
	24-38	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Brackett part	0-17	Gravelly clay loam.	CL, SC	A-6	0-20	70-100	60-100	55-95	40-85	28-40	10-20
	17-41	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Kavett:											
38	0-16	Silty clay	CH	A-7-6	0-2	90-100	80-100	75-100	70-95	51-66	25-40
	16-24	Indurated, unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Krum:											
39	0-8	Silty clay	CH	A-7-6	0	95-100	85-100	85-100	85-95	51-65	25-45
	8-58	Silty clay, clay	CH	A-7-6	0	95-100	85-100	80-100	65-95	51-74	28-50
	58-68	Silty clay loam, silty clay, clay.	CH, CL	A-7-6	0	85-100	75-100	70-95	65-95	48-60	28-38
Leeray:											
40, 41	0-48	Clay	CH	A-7-6	0-5	95-100	95-100	85-100	75-95	51-70	30-45
	48-56	Clay, silty clay	CH, CL	A-7-6	0-5	95-100	95-100	85-100	70-95	41-60	25-40
Lindy:											
42	0-6	Clay loam	CL, CL-ML	A-4, A-6	0-15	75-100	70-100	70-100	60-85	20-40	5-20
	6-28	Clay loam, clay	CL, CH	A-6, A-7	0-5	80-100	75-100	75-100	65-90	35-60	15-35
	28-36	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
May:											
43, 44	0-14	Fine sandy loam	SM, ML, CL-ML, SM-SC	A-4	0	95-100	95-100	80-100	40-60	<25	NP-7
	14-48	Sandy clay loam, clay loam.	SC, CL	A-6	0	95-100	95-100	80-100	40-75	25-40	12-25
	48-80	Sandy clay loam, fine sandy loam, loam.	SC, CL	A-4, A-6	0	95-100	95-100	75-100	40-75	20-40	8-25
Menard:											
45, 46, 47, 48	0-6	Fine sandy loam	SM, SM-SC, CL-ML, ML	A-2-4, A-4	0	95-100	95-100	75-100	30-60	<25	NP-7
	6-36	Sandy clay loam, clay loam.	SC, CL	A-6	0	95-100	95-100	80-100	36-70	26-40	10-22
	36-60	Sandy clay loam, clay loam, sandy loam.	SC, CL	A-4, A-6	0-5	80-100	75-100	65-99	40-60	20-35	8-20
149:											
Menard part	0-6	Fine sandy loam	SM, SM-SC, CL-ML, ML	A-2-4, A-4	0	95-100	95-100	75-100	30-60	<25	NP-7
	6-36	Sandy clay loam, clay loam.	SC, CL	A-6	0	95-100	95-100	80-100	36-70	26-40	10-22
	36-60	Sandy clay loam, clay loam, sandy loam.	SC, CL	A-4, A-6	0-5	80-100	75-100	65-99	40-60	20-35	8-20
Hext part	0-7	Loam	SM, SM-SC, SC, CL-ML	A-4	0-2	85-100	80-100	60-90	40-70	<25	NP-8
	7-24	Fine sandy loam, loam, sandy clay loam.	CL, SC, SM-SC, CL-ML	A-4, A-2-4	0-2	75-100	70-100	50-90	30-70	<30	NP-10
	24-38	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Mereta:											
50	0-18	Clay loam	CL, CH	A-6, A-7-6	0-5	90-100	83-100	80-97	60-85	39-52	19-30
	18-31	Variable, cemented.	---	---	---	---	---	---	---	---	---
	31-46	Variable, marl	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Miller:											
51----------	0-17	Silty clay------	CL, CH	A-6, A-7	0	100	98-100	96-100	80-99	35-60	15-35
	17-48	Clay, silty clay, silty clay loam.	CL, CH	A-7	0	100	98-100	96-100	90-99	41-65	20-40
	48-80	Clay, silty clay, silty clay loam.	CL, CH	A-6, A-7	0	100	98-100	96-100	80-99	35-60	15-35
Nimrod:											
52----------	0-30	Fine sand-------	SP-SM, SM, SM-SC	A-2-4, A-3	0	95-100	95-100	90-100	8-28	<25	NP-4
	30-66	Sandy clay loam	SC, CL	A-6, A-2-6	0	95-100	95-100	90-100	25-55	20-35	11-20
	66-80	Sandy loam, sandy clay loam, loamy fine sand.	SC, CL, SM-SC, CL-ML	A-4, A-6, A-2-4, A-2-6	0	95-100	95-100	90-100	15-55	20-30	4-16
Nukrum:											
53----------	0-24	Silty clay------	CL, CH	A-7-6	0	95-100	90-100	90-100	80-95	41-55	25-35
	24-56	Silty clay, clay, clay loam.	CL, CH	A-7-6	0	95-100	90-100	90-100	70-95	45-60	27-40
	56-72	Silty clay, clay loam, silty clay loam.	CL, CH	A-7-6	0	85-100	75-100	70-95	65-95	41-55	25-35
[1]54:											
Nukrum part-----	0-24	Silty clay------	CL, CH	A-7-6	0	95-100	90-100	90-100	80-95	41-55	25-35
	24-56	Silty clay, clay, clay loam.	CL, CH	A-7-6	0	95-100	90-100	90-100	70-95	45-60	27-40
	56-72	Silty clay, clay loam, silty clay loam.	CL, CH	A-7-6	0	85-100	75-100	70-95	65-95	41-55	25-35
Urban land part.											
Nuvalde:											
55----------	0-10	Clay loam-------	CH, CL	A-7-6	0	95-100	95-100	90-100	85-96	46-62	25-40
	10-32	Clay loam, clay, silty clay.	CH, CL	A-7-6	0	95-100	95-100	90-100	80-98	42-58	24-40
	32-60	Clay loam, silty clay loam, clay.	CL	A-6, A-7-6	0	85-100	80-100	70-98	65-98	32-50	14-32
Patilo:											
56----------	0-48	Fine sand-------	SM, SP-SM, SM-SC	A-2-4, A-3	0	100	95-100	85-100	8-28	<25	NP-5
	48-68	Sandy clay loam, fine sandy loam.	SC	A-2, A-4, A-6	0	90-100	90-100	90-100	25-50	22-36	8-20
Pedernales:											
57----------	0-14	Loamy fine sand	SM	A-2-4	0	95-100	90-100	75-95	15-33	<25	NP-3
	14-37	Sandy clay, clay	CH, CL, SC	A-7, A-6	0	90-100	90-100	85-100	45-75	38-60	20-36
	37-60	Sandy clay loam, clay loam, sandy clay.	SC, CL, CH	A-6, A-7	0-5	90-100	90-100	80-100	36-75	32-55	13-30
58, 59, 60--------	0-14	Fine sandy loam	SM, ML, CL-ML, SM-SC	A-4, A-2-4	0	95-100	90-100	75-100	33-55	<25	NP-7
	14-37	Sandy clay, clay	CH, CL, SC	A-7, A-6	0	90-100	90-100	85-100	45-75	38-60	20-36
	37-60	Sandy clay loam, clay loam, sandy clay.	SC, CL, CH	A-6, A-7	0-5	90-100	90-100	80-100	36-75	32-55	13-30

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Real:											
[1]61	0-11	Very gravelly loam.	GC, SC, GP-GM, SP-SM	A-2-6, A-2-4	1-10	25-75	10-50	10-45	10-35	25-35	8-15
	11-24	Variable, weathered bedrock.	---	---	---	---	---	---	---	---	---
[1]62:											
Real part	0-11	Gravelly clay loam.	GC, SC, GP-GM, SP-SM	A-2-6, A-2-4	1-10	25-75	10-50	10-45	10-35	25-35	8-15
	11-24	Variable, weathered bedrock.	---	---	---	---	---	---	---	---	---
Tarrant part	0-15	Cobbly clay	CH, GC	A-7-6	33-77	55-100	51-100	51-95	45-95	55-76	31-49
	15-20	Indurated, unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rochelle:											
63	0-8	Fine sandy loam	SM, SM-SC	A-2-4, A-4	0-2	90-100	90-100	65-85	25-45	<25	NP-7
	8-18	Sandy clay loam, gravelly sandy clay loam, gravelly fine sandy loam.	SC, CL	A-2-6, A-6, A-4, A-2-4	0-2	80-95	75-95	60-80	30-55	20-30	8-18
	18-32	Gravelly sandy clay loam, very gravelly sandy clay loam, gravelly clay loam.	SC, GC	A-2-6, A-6	0-5	50-85	50-85	30-65	15-45	25-35	11-20
	32-60	Very gravelly sandy loam, very gravelly sand, very gravelly fine sandy loam.	GM-GC, GM, GC, GP-GC	A-1, A-2-4	0-5	10-40	5-30	5-25	5-20	<25	NP-10
Rowena:											
64, 65	0-8	Clay loam	CL	A-6, A-7	0	95-100	90-100	85-100	70-85	35-50	15-30
	8-42	Clay, clay loam	CH, CL	A-7	0	95-100	95-100	90-100	75-95	41-55	25-35
	42-80	Clay, clay loam, silty clay loam.	CH, CL	A-6, A-7	0	85-100	75-100	65-90	55-85	35-55	15-28
Sagerton:											
66, 67	0-6	Clay loam	CL	A-6, A-4	0	95-100	95-100	90-100	55-80	25-35	8-18
	6-27	Clay loam, clay	CL	A-6, A-7-6	0	95-100	95-100	90-100	65-95	36-50	18-30
	27-80	Clay loam, clay	CL	A-6, A-4	0	90-100	90-100	80-100	60-85	25-40	8-22
[1]68:											
Sagerton part	0-6	Clay loam	CL	A-6, A-4	0	95-100	95-100	90-100	55-80	25-35	8-18
	6-27	Clay loam, clay	CL	A-6, A-7-6	0	95-100	95-100	90-100	65-95	36-50	18-30
	27-80	Clay loam, clay	CL	A-6, A-4	0	90-100	90-100	80-100	60-85	25-40	8-22
Urban land part.											
Speck:											
69	0-7	Clay loam	CL	A-6, A-7-6	0	90-100	90-100	80-95	70-90	30-45	15-25
	7-15	Clay, clay loam	CL, CH	A-7-6	0	85-100	80-100	70-100	55-95	45-65	25-40
	15-17	Indurated, unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Speck:											
[1]70:											
Speck part------	0-7	Stony clay loam	CL	A-6, A-7-6	5-25	80-100	80-100	80-95	70-90	30-45	15-25
	7-15	Clay, clay loam, cobbly clay.	CL, CH	A-7-6	0-25	85-100	80-100	70-100	55-95	45-65	25-40
	15-17	Indurated, unweathered bedrock.	---	---	---	---	---	---	---	---	---
Urban land part.											
[1]71:											
Speck part------	0-7	Stony clay loam	CL	A-6, A-7-6	5-25	80-100	80-100	80-95	70-90	30-45	15-25
	7-15	Clay, clay loam, cobbly clay.	CL, CH	A-7-6	0-25	85-100	80-100	70-100	55-95	45-65	25-40
	15-17	Indurated, unweathered bedrock.	---	---	---	---	---	---	---	---	---
Tarrant part----	0-15	Cobbly clay-----	CH, GC	A-7-6	33-77	55-100	51-100	51-95	45-95	55-76	31-49
	15-20	Indurated, unweathered bedrock.	---	---	---	---	---	---	---	---	---
Sunev:											
72----------	0-18	Clay loam-------	CL, SC	A-4, A-6	0	90-100	80-100	80-100	45-60	25-40	8-18
	18-32	Loam, clay loam, silty clay loam.	CL	A-4, A-6	0	90-100	80-100	80-100	51-65	28-40	8-18
	32-80	Loam, clay loam, silty clay loam.	CL	A-4, A-6	0	90-100	75-100	75-100	51-61	25-40	8-18
Tarpley:											
73----------	0-7	Clay loam-------	CL, CH	A-7	0-3	90-100	90-100	80-95	70-90	41-60	20-38
	7-18	Clay------------	CH	A-7	0	90-100	90-100	90-100	65-98	70-90	45-60
	18-22	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
[1]74:											
Tarpley part----	0-7	Stony clay loam	CL, CH	A-7	10-30	85-100	85-98	75-95	65-90	41-60	20-38
	7-18	Clay, cobbly clay.	CH	A-7	0-15	85-100	85-100	85-100	60-95	70-90	45-60
	18-22	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Tarrant part----	0-15	Cobbly clay-----	CH, GC	A-7-6	33-77	55-100	51-100	51-95	45-95	55-76	31-49
	15-20	Indurated, unweathered bedrock.	---	---	---	---	---	---	---	---	---
Tarrant:											
[1]75:											
Tarrant part----	0-15	Cobbly clay-----	CH, GC	A-7-6	33-77	55-100	51-100	51-95	45-95	55-76	31-49
	15-20	Indurated, unweathered bedrock.	---	---	---	---	---	---	---	---	---
Tarpley part----	0-7	Stony clay loam	CL, CH	A-7	10-30	85-100	85-98	75-95	65-90	41-60	20-38
	7-18	Clay, cobbly clay.	CH	A-7	0-15	85-100	85-100	85-100	60-95	70-90	45-60
	18-22	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	> 3 inches	4	10	40	200		
	In				Pct					Pct	
Throck:											
[1]76	0-8	Stony clay loam	CL	A-6, A-7	5-30	70-90	70-90	60-90	51-85	30-45	18-28
	8-32	Gravelly clay, gravelly silty clay, clay.	CL, SC	A-6, A-7	0-5	55-99	55-99	50-99	40-90	35-48	20-30
	32-60	Clay, silty clay loam, shaly clay.	CL	A-6, A-7	0	95-100	95-100	90-100	75-95	30-50	14-30
Weswood:											
77	0-8	Silt loam	CL, CL-ML	A-4, A-6	0	100	100	95-100	70-95	20-35	4-15
	8-80	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	100	90-100	70-98	30-46	11-26
Winters:											
78, 79, 80	0-6	Fine sandy loam	SM, SM-SC	A-4	0	98-100	95-100	70-90	36-50	<25	NP-7
	6-48	Sandy clay, clay, clay loam.	CL, CH	A-7-6	0	95-100	90-100	80-100	51-75	41-52	20-30
	48-80	Clay loam, sandy clay loam, sandy clay.	CL, CH	A-6, A-7-6	0	95-100	90-100	80-100	51-75	38-52	17-30
[1]81:											
Winters part	0-6	Fine sandy loam	SM, SM-SC	A-4	0	98-100	95-100	70-90	36-50	<25	NP-7
	6-48	Sandy clay, clay, clay loam.	CL, CH	A-7-6	0	95-100	90-100	80-100	51-75	41-52	20-30
	48-80	Clay loam, sandy clay loam, sandy clay.	CL, CH	A-6, A-7-6	0	95-100	90-100	80-100	51-75	38-52	17-30
Urban land part.											

[1]This map unit is made up of two or more dominant kinds of soil. See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS

[The symbol < means less than. Entries under "Erosion factors--T" apply to entire profile. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete	Erosion factors: K	Erosion factors: T	Wind erodibility group
	In	In/hr	In/in	pH						
Abilene:										
1, 2	0-10	0.6-2.0	0.15-0.20	6.6-8.4	Moderate	High	Low	0.37	5	---
	10-42	0.2-0.6	0.14-0.18	6.6-8.4	Moderate	High	Low	0.28		
	42-64	0.2-0.6	0.12-0.15	7.9-8.4	Moderate	High	Low	0.32		
[1]3:										
Abilene part	0-10	0.6-2.0	0.15-0.20	6.6-8.4	Moderate	High	Low	0.37	5	---
	10-42	0.2-0.6	0.14-0.18	6.6-8.4	Moderate	High	Low	0.28		
	42-64	0.2-0.6	0.12-0.15	7.9-8.4	Moderate	High	Low	0.32		
Urban land part.										
Bastrop:										
4	0-18	2.0-6.0	0.11-0.17	5.6-7.3	Low	Low	Low	0.24	5	---
	18-80	0.6-2.0	0.15-0.19	6.1-8.4	Low	Moderate	Low	0.32		
Bolar:										
5	0-12	0.6-2.0	0.11-0.20	7.9-8.4	Moderate	High	Low	0.32	2	---
	12-30	0.6-2.0	0.11-0.20	7.9-8.4	Moderate	High	Low	---		
	30-36	---	---	---	---	---	---	---		
[1]6:										
Bolar part	0-12	0.6-2.0	0.10-0.18	7.9-8.4	Moderate	High	Low	0.32	2	---
	12-30	0.6-2.0	0.11-0.20	7.9-8.4	Moderate	High	Low	---		
	30-36	---	---	---	---	---	---	---		
Brackett part	0-17	0.2-0.6	0.10-0.20	7.9-8.4	Low	High	Low	0.32	2	---
	17-41	---	---	---	---	---	---	---		
Bonti:										
7, 8	0-11	0.6-2.0	0.11-0.15	5.6-7.3	Low	Low	Moderate	0.37	2	---
	11-38	0.2-0.6	0.15-0.20	5.1-6.0	Moderate	High	Moderate	0.28		
	38-40	---	---	---	---	---	---	---		
[1]9:										
Bonti part	0-11	0.6-2.0	0.11-0.15	5.6-7.3	Low	Low	Moderate	0.37	2	---
	11-38	0.2-0.6	0.15-0.20	5.1-6.0	Moderate	High	Moderate	0.28		
	38-40	---	---	---	---	---	---	---		
Urban land part.										
[1]10:										
Bonti part	0-11	0.6-2.0	0.08-0.12	5.6-7.3	Low	Low	Moderate	0.32	2	---
	11-38	0.2-0.6	0.15-0.20	5.1-6.0	Moderate	High	Moderate	0.28		
	38-40	---	---	---	---	---	---	---		
Callahan part	0-4	0.2-0.6	0.11-0.16	6.6-8.4	Low	Moderate	Low	0.32	4	---
	4-38	<0.06	0.12-0.18	7.4-8.4	Moderate	High	Low	0.32		
	38-65	---	---	---	---	---	---	---		
[1]11:										
Bonti part	0-11	0.6-2.0	0.08-0.12	5.6-7.3	Low	Low	Moderate	0.32	2	---
	11-38	0.2-0.6	0.15-0.20	5.1-6.0	Moderate	High	Moderate	0.28		
	38-40	---	---	---	---	---	---	---		
Throck part	0-8	0.2-0.6	0.10-0.18	7.9-8.4	Moderate	High	Low	0.32	3	---
	8-32	0.06-0.2	0.12-0.20	7.9-8.4	Moderate	High	Low	0.32		
	32-60	0.06-0.2	0.10-0.18	7.9-8.4	Moderate	High	Low	0.32		
Bosque:										
12	0-26	0.6-2.0	0.15-0.20	7.4-8.4	Low	High	Low	0.28	5	---
	26-48	0.6-2.0	0.15-0.20	7.4-8.4	Low	High	Low	0.28		
	48-64	0.6-2.0	0.11-0.18	7.9-8.4	Low	High	Moderate	0.28		
Brackett:										
[1]13	0-17	0.2-0.6	0.10-0.20	7.9-8.4	Low	High	Low	0.32	2	---
	17-41	---	---	---	---	---	---	---		

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete	Erosion factors: K	Erosion factors: T	Wind erodibility group
	In	In/hr	In/in	pH						
Brackett:										
[1]14:										
Brackett part---	0-17	0.2-0.6	0.10-0.20	7.9-8.4	Low-------	High------	Low-------	0.32	2	---
	17-41	---	---	---	----------	----------	----------	---		
Tarrant part----	0-15	0.2-0.6	0.10-0.17	7.9-8.4	Low-------	High------	Low-------	0.32	1	---
	15-20	---	---	---	----------	----------	----------	---		
Callahan:										
15, 16----------	0-4	0.2-0.6	0.15-0.20	6.6-8.4	Low-------	Moderate	Low-------	0.32	4	---
	4-38	<0.06	0.12-0.18	7.4-8.4	Moderate	High------	Low-------	0.32		
	38-65	---	---	---	----------	----------	----------	---		
[1]17:										
Callahan part---	0-4	0.2-0.6	0.15-0.20	6.6-8.4	Low-------	Moderate	Low-------	0.32	4	---
	4-38	<0.06	0.12-0.18	7.4-8.4	Moderate	High------	Low-------	0.32		
	38-65	---	---	---	----------	----------	----------	---		
Urban land part.										
[1]18:										
Callahan part---	0-4	0.2-0.6	0.11-0.16	6.6-8.4	Low-------	Moderate	Low-------	0.32	4	---
	4-38	<0.06	0.12-0.18	7.4-8.4	Moderate	High------	Low-------	0.32		
	38-65	---	---	---	----------	----------	----------	---		
Throck part-----	0-8	0.2-0.6	0.10-0.18	7.9-8.4	Moderate	High------	Low-------	0.32	3	---
	8-32	0.06-0.2	0.12-0.20	7.9-8.4	Moderate	High------	Low-------	0.32		
	32-60	0.06-0.2	0.10-0.18	7.9-8.4	Moderate	High------	Low-------	0.32		
Caradan:										
19----------	0-4	0.06-0.2	0.15-0.20	6.1-7.8	High------	High------	Low-------	0.32	5	---
	4-25	<0.06	0.12-0.18	6.1-7.8	Very high	High------	Low-------	0.32		
	25-36	0.06-0.2	0.12-0.18	7.9-8.4	High------	High------	Low-------	0.32		
	36-62	0.6-2.0	0.10-0.15	7.9-8.4	Low-------	High------	Low-------	0.43		
Chaney:										
20----------	0-18	2.0-6.0	0.05-0.10	5.6-7.3	Very low	Low-------	Low-------	0.20	5	2
	18-44	0.06-0.2	0.15-0.18	5.6-6.5	Moderate	High------	Moderate	0.28		
	44-54	0.06-0.2	0.15-0.18	5.6-7.8	Moderate	High------	Moderate	0.28		
Cisco:										
21----------	0-8	2.0-6.0	0.07-0.11	6.1-7.3	Very low	Low-------	Low-------	0.20	5	2
	8-46	0.6-2.0	0.15-0.19	6.1-7.8	Moderate	Moderate	Low-------	0.32		
	46-63	2.0-6.0	0.11-0.17	7.4-8.4	Low-------	High------	Low-------	0.32		
22, 23----------	0-8	2.0-6.0	0.11-0.15	6.1-7.3	Low-------	Low-------	Low-------	0.37	5	---
	8-46	0.6-2.0	0.15-0.19	6.1-7.8	Moderate	Moderate	Low-------	0.32		
	46-63	2.0-6.0	0.11-0.17	7.4-8.4	Low-------	High------	Low-------	0.32		
Clairemont:										
[1]24----------	0-62	0.6-2.0	0.16-0.22	7.9-8.4	Low-------	Moderate	Low-------	0.43	5	6
Deleon:										
25----------	0-66	0.06-0.2	0.14-0.18	6.6-8.4	High------	High------	Low-------	0.32	5	---
	66-80	0.06-0.2	0.14-0.22	7.9-8.4	High------	High------	Low-------	0.32		
[1]26:										
Deleon part-----	0-66	0.06-0.2	0.14-0.18	6.6-8.4	High------	High------	Low-------	0.32	5	---
	66-80	0.06-0.2	0.14-0.22	7.9-8.4	High------	High------	Low-------	0.32		
Urban land part.										
Denton:										
27----------	0-16	0.06-0.2	0.15-0.20	7.9-8.4	High------	High------	Low-------	0.32	2	---
	16-28	0.06-0.2	0.15-0.20	7.9-8.4	High------	High------	Low-------	---		
	28-36	---	---	---	----------	----------	----------	---		
Desan:										
28----------	0-54	6.0-20	0.05-0.08	5.1-7.3	Very low	Low-------	Low-------	0.17	5	2
	54-80	0.6-2.0	0.14-0.18	5.1-6.5	Low-------	Moderate	Moderate	0.24		

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Risk of corrosion		Erosion factors		Wind erodibility group
						Uncoated steel	Concrete	K	T	
	In	In/hr	In/in	pH						
Doudle:										
[1]29:										
Doudle part-----	0-6	2.0-6.0	0.10-0.15	7.4-8.4	Low-------	Moderate	Low-------	0.28	3	---
	6-36	2.0-6.0	0.10-0.18	7.4-8.4	Low-------	Moderate	Low-------	0.28		
	36-60	---	---	---	----------	----------	----------	---		
Real part-------	0-11	0.6-2.0	0.05-0.10	7.9-8.4	Low-------	High------	Low-------	0.10	1	---
	11-24	---	---	---	----------	----------	----------	---		
Energy:										
30----------	0-8	0.6-2.0	0.11-0.15	7.9-8.4	Low-------	Moderate	Low-------	---	---	---
	8-48	0.6-2.0	0.11-0.20	7.9-8.4	Low-------	Moderate	Low-------	---		
	48-80	0.6-2.0	0.11-0.20	7.9-8.4	Low-------	Moderate	Low-------	---		
Frio:										
31, 32----------	0-34	0.2-0.6	0.15-0.22	7.9-8.4	Moderate	High------	Low-------	---	---	---
	34-72	0.2-0.6	0.11-0.22	7.9-8.4	Moderate	High------	Low-------	---		
[1]33:										
Frio part-------	0-34	0.2-0.6	0.15-0.22	7.9-8.4	Moderate	High------	Low-------	---	---	---
	34-72	0.2-0.6	0.11-0.22	7.9-8.4	Moderate	High------	Low-------	---		
Urban land part.										
Heaton:										
34----------	0-30	2.0-6.0	0.05-0.09	5.6-7.3	Very low	Low-------	Low-------	0.17	5	2
	30-55	0.6-2.0	0.14-0.16	5.6-7.3	Low-------	Moderate	Low-------	0.24		
	55-80	0.6-2.0	0.10-0.14	5.6-7.3	Low-------	Moderate	Low-------	0.24		
Hext:										
35, 36----------	0-7	0.6-2.0	0.11-0.18	7.4-8.4	Low-------	Moderate	Low-------	0.28	3	---
	7-24	0.6-2.0	0.11-0.18	7.9-8.4	Low-------	Moderate	Low-------	0.28		
	24-38	---	---	---	----------	----------	----------	---		
[1]37:										
Hext part-------	0-7	0.6-2.0	0.11-0.18	7.4-8.4	Low-------	Moderate	Low-------	0.28	3	---
	7-24	0.6-2.0	0.11-0.18	7.9-8.4	Low-------	Moderate	Low-------	0.28		
	24-38	---	---	---	----------	----------	----------	---		
Brackett part---	0-17	0.2-0.6	0.10-0.20	7.9-8.4	Low-------	High------	Low-------	0.32	2	---
	17-41	---	---	---	----------	----------	----------	---		
Kavett:										
38----------	0-16	0.2-0.6	0.15-0.20	7.9-8.4	High------	High------	Low-------	0.32	1	---
	16-24	---	---	---	----------	----------	----------	---		
Krum:										
39----------	0-8	0.2-0.6	0.15-0.20	7.4-8.4	High------	High------	Low-------	0.32	5	---
	8-58	0.2-0.6	0.14-0.20	7.9-8.4	High------	High------	Low-------	0.32		
	58-68	0.2-0.6	0.14-0.20	7.9-8.4	High------	High------	Low-------	0.32		
Leeray:										
40, 41----------	0-48	<0.06	0.12-0.18	7.9-8.4	Very high	High------	Low-------	0.32	5	---
	48-56	<0.06	0.10-0.15	7.9-8.4	Very high	High------	Low-------	0.32		
Lindy:										
42----------	0-6	0.6-2.0	0.12-0.20	6.1-7.8	Low-------	High------	Low-------	0.37	2	---
	6-28	0.06-0.2	0.10-0.20	6.1-7.8	Moderate	High------	Low-------	0.32		
	28-36	---	---	---	----------	----------	----------	---		
May:										
43, 44----------	0-14	2.0-6.0	0.11-0.15	6.1-7.8	Low-------	Low-------	Low-------	0.37	5	---
	14-48	0.6-2.0	0.12-0.20	6.6-7.8	Moderate	Moderate	Low-------	0.37		
	48-80	0.6-2.0	0.11-0.20	7.4-8.4	Moderate	High------	Low-------	0.37		
Menard:										
45, 46, 47, 48----	0-6	2.0-6.0	0.11-0.17	6.6-7.8	Low-------	Low-------	Low-------	0.43	5	---
	6-36	0.6-2.0	0.15-0.19	6.1-7.8	Low-------	Moderate	Low-------	0.49		
	36-60	2.0-6.0	0.11-0.17	7.9-8.4	Low-------	High------	Low-------	0.49		

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete	Erosion factors: K	Erosion factors: T	Wind erodibility group
	In	In/hr	In/in	pH						
Menard:										
149:										
Menard part-----	0-6	2.0-6.0	0.11-0.17	6.6-7.8	Low-------	Low-------	Low-------	0.43	5	---
	6-36	0.6-2.0	0.15-0.19	6.1-7.8	Low-------	Moderate	Low-------	0.49		
	36-60	2.0-6.0	0.11-0.17	7.9-8.4	Low-------	High------	Low-------	0.49		
Hext part-------	0-7	0.6-2.0	0.11-0.18	7.4-8.4	Low-------	Moderate	Low-------	0.28	3	---
	7-24	0.6-2.0	0.11-0.18	7.9-8.4	Low-------	Moderate	Low-------	0.28		
	24-38	---	---	---	----------	----------	----------	---		
Mereta:										
50----------	0-18	0.2-0.6	0.15-0.20	7.9-8.4	Moderate	High------	Low-------	0.32	2	---
	18-31	---	---	---	----------	----------	----------	---		
	31-46	---	---	---	----------	----------	----------	---		
Miller:										
51----------	0-17	0.06-0.2	0.16-0.2	7.4-8.4	High------	High------	Low-------	---	---	---
	17-48	<0.06	0.15-0.19	7.4-8.4	High------	High------	Low-------	---		
	48-80	0.06-0.2	0.15-0.19	7.9-8.4	High------	High------	Low-------	---		
Nimrod:										
52----------	0-30	6.0-20	0.05-0.10	5.6-7.3	Very low	Low-------	Low-------	0.20	5	2
	30-66	0.2-0.6	0.12-0.17	5.1-6.0	Low-------	High------	Moderate	0.32		
	66-80	0.2-0.6	0.06-0.17	5.1-6.5	Low-------	High------	Moderate	0.32		
Nukrum:										
53----------	0-24	0.2-0.6	0.15-0.20	7.9-8.4	High------	High------	Low-------	0.32	5	---
	24-56	0.2-0.6	0.15-0.20	7.9-8.4	High------	High------	Low-------	0.32		
	56-72	0.2-0.6	0.13-0.18	7.9-8.4	High------	High------	Low-------	0.32		
154:										
Nukrum part-----	0-24	0.2-0.6	0.15-0.20	7.9-8.4	High------	High------	Low-------	0.32	5	---
	24-56	0.2-0.6	0.15-0.20	7.9-8.4	High------	High------	Low-------	0.32		
	56-72	0.2-0.6	0.13-0.18	7.9-8.4	High------	High------	Low-------	0.32		
Urban land part.										
Nuvalde:										
55----------	0-10	0.6-2.0	0.14-0.20	7.9-8.4	High------	High------	Low-------	0.28	5	---
	10-32	0.6-2.0	0.12-0.18	7.9-8.4	High------	High------	Low-------	0.28		
	32-60	0.6-2.0	0.12-0.18	7.9-8.4	Moderate	High------	Low-------	0.32		
Patilo:										
56----------	0-48	6.0-20	0.05-0.08	5.6-7.3	Very low	Low-------	Low-------	0.17	5	2
	48-68	0.2-0.6	0.14-0.18	5.1-6.5	Low-------	High------	Moderate	---		
Pedernales:										
57----------	0-14	2.0-6.0	0.07-0.11	6.1-7.8	Low-------	Low-------	Low-------	0.24	5	---
	14-37	0.2-0.6	0.15-0.20	6.1-7.8	Moderate	High------	Low-------	0.24		
	37-60	0.2-0.6	0.15-0.20	7.9-8.4	Moderate	Moderate	Low-------	0.15		
58, 59, 60--------	0-14	0.6-2.0	0.12-0.17	6.1-7.8	Low-------	Low-------	Low-------	0.37	5	---
	14-37	0.2-0.6	0.15-0.20	6.1-7.8	Moderate	High------	Low-------	0.24		
	37-60	0.2-0.6	0.15-0.20	7.9-8.4	Moderate	Moderate	Low-------	0.15		
Real:										
161----------	0-11	0.6-2.0	0.05-0.10	7.9-8.4	Low-------	High------	Low-------	0.10	1	---
	11-24	---	---	---	----------	----------	----------	---		
162:										
Real part-------	0-11	0.6-2.0	0.05-0.10	7.9-8.4	Low-------	High------	Low-------	0.10	1	---
	11-24	---	---	---	----------	----------	----------	---		
Tarrant part----	0-15	0.2-0.6	0.10-0.17	7.9-8.4	Low-------	High------	Low-------	0.32	1	---
	15-20	---	---	---	----------	----------	----------	---		
Rochelle:										
63----------	0-8	0.6-2.0	0.10-0.15	6.6-7.8	Low-------	Moderate	Low-------	0.37	3	---
	8-18	0.6-2.0	0.10-0.15	6.6-7.8	Low-------	Moderate	Low-------	0.32		
	18-32	0.2-0.6	0.05-0.10	6.6-7.8	Low-------	Moderate	Low-------	0.32		
	32-60	2.0-6.0	0.01-0.05	7.9-8.4	Very low	Moderate	Low-------	0.17		

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Risk of corrosion		Erosion factors		Wind erodibility group
						Uncoated steel	Concrete	K	T	
	In	In/hr	In/in	pH						
Rowena:										
64, 65	0-8	0.2-0.6	0.15-0.20	7.9-8.4	Moderate	High	Low	0.32	5	---
	8-42	0.2-0.6	0.14-0.18	7.9-8.4	High	High	Low	0.32		
	42-80	0.2-0.6	0.11-0.15	7.9-8.4	High	High	Low	0.32		
Sagerton:										
66, 67	0-6	0.6-2.0	0.15-0.20	6.6-7.8	Moderate	Moderate	Low	0.32	5	6
	6-27	0.2-0.6	0.14-0.19	6.6-8.4	Moderate	Moderate	Low	0.32		
	27-80	0.2-0.6	0.10-0.17	7.9-8.4	Moderate	Moderate	Low	0.32		
[1]68:										
Sagerton part	0-6	0.6-2.0	0.15-0.20	6.6-7.8	Moderate	Moderate	Low	0.32	5	6
	6-27	0.2-0.6	0.14-0.19	6.6-8.4	Moderate	Moderate	Low	0.32		
	27-80	0.2-0.6	0.10-0.17	7.9-8.4	Moderate	Moderate	Low	0.32		
Urban land part.										
Speck:										
69	0-7	0.2-0.6	0.15-0.20	6.1-7.8	Moderate	High	Low	0.32	1	---
	7-15	0.06-0.2	0.12-0.18	6.1-7.8	High	High	Low	0.32		
	15-17	---	---	---	---	---	---	---		
[1]70:										
Speck part	0-7	0.2-0.6	0.10-0.18	6.1-7.8	Moderate	High	Low	0.32	1	---
	7-15	0.06-0.2	0.10-0.15	6.1-7.8	High	High	Low	0.32		
	15-17	---	---	---	---	---	---	---		
Urban land part.										
[1]71:										
Speck part	0-7	0.2-0.6	0.10-0.18	6.1-7.8	Moderate	High	Low	0.32	1	---
	7-15	0.06-0.2	0.10-0.15	6.1-7.8	High	High	Low	0.32		
	15-17	---	---	---	---	---	---	---		
Tarrant part	0-15	0.2-0.6	0.10-0.17	7.9-8.4	Low	High	Low	0.32	1	---
	15-20	---	---	---	---	---	---	---		
Sunev:										
72	0-18	0.6-2.0	0.11-0.16	7.9-8.4	Low	Moderate	Low	0.28	5	---
	18-32	0.6-2.0	0.11-0.16	7.9-8.4	Low	Moderate	Low	0.28		
	32-80	0.6-2.0	0.11-0.16	7.9-8.4	Low	Moderate	Low	0.28		
Tarpley:										
73	0-7	0.2-0.6	0.15-0.20	6.1-7.8	High	High	Low	0.32	1	---
	7-18	0.06-0.2	0.12-0.18	6.1-7.8	Very high	High	Low	0.32		
	18-22	---	---	---	---	---	---	---		
[1]74:										
Tarpley part	0-7	0.2-0.6	0.10-0.16	6.1-7.8	High	High	Low	0.32	1	---
	7-18	0.06-0.2	0.10-0.18	6.1-7.8	Very high	High	Low	0.32		
	18-22	---	---	---	---	---	---	---		
Tarrant part	0-15	0.2-0.6	0.10-0.17	7.9-8.4	Low	High	Low	0.32	1	---
	15-20	---	---	---	---	---	---	---		
Tarrant:										
[1]75:										
Tarrant part	0-15	0.2-0.6	0.10-0.17	7.9-8.4	Low	High	Low	0.32	1	---
	15-20	---	---	---	---	---	---	---		
Tarpley part	0-7	0.2-0.6	0.10-0.16	6.1-7.8	High	High	Low	0.32	1	---
	7-18	0.06-0.2	0.10-0.18	6.1-7.8	Very high	High	Low	0.32		
	18-22	---	---	---	---	---	---	---		
Throck:										
[1]76	0-8	0.2-0.6	0.10-0.18	7.9-8.4	Moderate	High	Low	0.32	3	---
	8-32	0.06-0.2	0.12-0.20	7.9-8.4	Moderate	High	Low	0.32		
	32-60	0.06-0.2	0.10-0.18	7.9-8.4	Moderate	High	Low	0.32		

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete	Erosion factors: K	Erosion factors: T	Wind erodibility group
	In	In/hr	In/in	pH						
Weswood:										
77	0-8	0.6-2.0	0.15-0.20	7.9-8.4	Low	High	Low	0.43	5	---
	8-80	0.6-2.0	0.15-0.22	7.9-8.4	Low	High	Low	0.43		
Winters:										
78, 79, 80	0-6	2.0-6.0	0.10-0.14	6.6-7.8	Low	Low	Low	0.24	5	3
	6-48	0.2-0.6	0.14-0.18	7.4-8.4	Moderate	High	Low	0.28		
	48-80	0.6-2.0	0.14-0.18	7.9-8.4	Moderate	High	Low	0.24		
[1]81:										
Winters part	0-6	2.0-6.0	0.10-0.14	6.6-7.8	Low	Low	Low	0.24	5	3
	6-48	0.2-0.6	0.14-0.18	7.4-8.4	Moderate	High	Low	0.28		
	48-80	0.6-2.0	0.14-0.18	7.9-8.4	Moderate	High	Low	0.24		
Urban land part.										

[1]This map unit is made up of two or more dominant kinds of soil. See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--SOIL AND WATER FEATURES

[Absence of an entry indicates that the feature is not a concern. See text for descriptions of symbols and such terms as "rare," "brief," and "perched." The symbol > means more than]

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Cemented pan	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Depth	Hardness
					Ft			In		In	
Abilene:											
1, 2	C	None	---	---	>6.0	---	---	>60	---	---	---
[1]3:											
Abilene part	C	None	---	---	>6.0	---	---	>60	---	---	---
Urban land part.											
Bastrop:											
4	B	None	---	---	>6.0	---	---	>60	---	---	---
Bolar:											
5	C	None	---	---	>6.0	---	---	20-40	Rippable	---	---
[1]6:											
Bolar part	C	None	---	---	>6.0	---	---	20-40	Rippable	---	---
Brackett part	C	None	---	---	>6.0	---	---	10-20	Rippable	---	---
Bonti:											
7, 8	C	None	---	---	>6.0	---	---	20-40	Rippable	---	---
[1]9:											
Bonti part	C	None	---	---	>6.0	---	---	20-40	Rippable	---	---
Urban land part.											
[1]10:											
Bonti part	C	None	---	---	>6.0	---	---	20-40	Rippable	---	---
Callahan part	D	None	---	---	>6.0	---	---	20-40	Rippable	---	---
[1]11:											
Bonti part	C	None	---	---	>6.0	---	---	20-40	Rippable	---	---
Throck part	C	None	---	---	>6.0	---	---	40-80	Rippable	---	---
Bosque:											
12	B	Occasional	Brief	May-Oct	>6.0	---	---	>60	---	---	---
Brackett:											
[1]13	C	None	---	---	>6.0	---	---	10-20	Rippable	---	---
[1]14:											
Brackett part	C	None	---	---	>6.0	---	---	10-20	Rippable	---	---
Tarrant part	D	None	---	---	>6.0	---	---	6-20	Hard	---	---
Callahan:											
15, 16	D	None	---	---	>6.0	---	---	20-40	Rippable	---	---

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Cemented pan	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Depth	Hardness
					Ft			In		In	
Callahan:											
[1]17:											
Callahan part--	D	None--------	---	---	>6.0	---	---	20-40	Rippable	---	---
Urban land part.											
[1]18:											
Callahan part--	D	None--------	---	---	>6.0	---	---	20-40	Rippable	---	---
Throck part----	C	None--------	---	---	>6.0	---	---	40-80	Rippable	---	---
Caradan:											
19----------	D	None--------	---	---	>6.0	---	---	>60	---	---	---
Chaney:											
20----------	C	None--------	---	---	>6.0	---	---	>60	---	---	---
Cisco:											
21, 22, 23-------	B	None--------	---	---	>6.0	---	---	>60	---	---	---
Clairemont:											
[1]24----------	B	Frequent----	Very brief	Apr-Nov	>6.0	---	---	>60	---	---	---
Deleon:											
25----------	C	Rare--------	Brief-----	May-Oct	>6.0	---	---	>60	---	---	---
[1]26:											
Deleon part----	C	Rare--------	Brief-----	May-Oct	>6.0	---	---	>60	---	---	---
Urban land part.											
Denton:											
27----------	D	None--------	---	---	>6.0	---	---	22-40	Rippable	---	---
Desan:											
28----------	A	None--------	---	---	>6.0	---	---	>60	---	---	---
Doudle:											
[1]29:											
Doudle part----	B	None--------	---	---	>6.0	---	---	20-40	Rippable	---	---
Real part------	D	None--------	---	---	>6.0	---	---	8-20	Rippable	---	---
Energy:											
30----------	B	Occasional--	Brief-----	May-Oct	>6.0	---	---	>60	---	---	---
Frio:											
31----------	B	Occasional--	Brief-----	May-Oct	>6.0	---	---	>60	---	---	---
32----------	B	Frequent----	Brief-----	May-Oct	>6.0	---	---	>60	---	---	---
[1]33:											
Frio part------	B	Rare--------	Brief-----	May-Oct	>6.0	---	---	>60	---	---	---
Urban land part.											

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Cemented pan	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Depth	Hardness
					Ft			In		In	
Heaton: 34	A	None	---	---	>6.0	---	---	>60	---	---	---
Hext: 35, 36	B	None	---	---	>6.0	---	---	20-40	Rippable	---	---
[1]37: Hext part	B	None	---	---	>6.0	---	---	20-40	Rippable	---	---
Brackett part	C	None	---	---	>6.0	---	---	10-20	Rippable	---	---
Kavett: 38	D	None	---	---	>6.0	---	---	11-26	Hard	10-20	Hard
Krum: 39	D	None	---	---	>6.0	---	---	>60	---	---	---
Leeray: 40, 41	D	None	---	---	>6.0	---	---	>60	---	---	---
Lindy: 42	C	None	---	---	>6.0	---	---	24-40	Hard	---	---
May: 43, 44	B	None	---	---	>6.0	---	---	>60	---	---	---
Menard: 45, 46, 47, 48	B	None	---	---	>6.0	---	---	>60	---	---	---
[1]49: Menard part	B	None	---	---	>6.0	---	---	>60	---	---	---
Hext part	B	None	---	---	>6.0	---	---	20-40	Rippable	---	---
Mereta: 50	C	None	---	---	>6.0	---	---	>60	---	14-20	Rippable
Miller: 51	D	Occasional	Brief	Mar-May	>6.0	---	---	>60	---	---	---
Nimrod: 52	C	None	---	---	1.5-3.5	Perched	May-Oct	>60	---	---	---
Nukrum: 53	D	None	---	---	>6.0	---	---	>60	---	---	---
[1]54: Nukrum part	D	None	---	---	>6.0	---	---	>60	---	---	---
Urban land part.											
Nuvalde: 55	B	None	---	---	>6.0	---	---	>60	---	---	---
Patilo: 56	B	None	---	---	3.0-6.0	Perched	May-Oct	>60	---	---	---
Pedernales: 57, 58, 59, 60	C	None	---	---	>6.0	---	---	>60	---	---	---
Real: [1]61	D	None	---	---	>6.0	---	---	8-20	Rippable	---	---

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Cemented pan	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Depth	Hardness
					Ft			In		In	
Real:											
[1]62:											
Real part	D	None	---	---	>6.0	---	---	8-20	Rippable	---	---
Tarrant part	D	None	---	---	>6.0	---	---	6-20	Hard	---	---
Rochelle:											
63	C	None	---	---	>6.0	---	---	>60	---	---	---
Rowena:											
64, 65	C	None	---	---	>6.0	---	---	>60	---	---	---
Sagerton:											
66, 67	C	None	---	---	>6.0	---	---	>60	---	---	---
[1]68:											
Sagerton part	C	None	---	---	>6.0	---	---	>60	---	---	---
Urban land part.											
Speck:											
69	D	None	---	---	>6.0	---	---	14-20	Hard	---	---
[1]70:											
Speck part	D	None	---	---	>6.0	---	---	14-20	Hard	---	---
Urban land part.											
[1]71:											
Speck part	D	None	---	---	>6.0	---	---	14-20	Hard	---	---
Tarrant part	D	None	---	---	>6.0	---	---	6-20	Hard	---	---
Sunev:											
72	B	None	---	---	>6.0	---	---	>60	---	---	---
Tarpley:											
73	D	None	---	---	>6.0	---	---	13-20	Hard	---	---
[1]74:											
Tarpley part	D	None	---	---	>6.0	---	---	13-20	Hard	---	---
Tarrant part	D	None	---	---	>6.0	---	---	6-20	Hard	---	---
Tarrant:											
[1]75:											
Tarrant part	D	None	---	---	>6.0	---	---	6-20	Hard	---	---
Tarpley part	D	None	---	---	>6.0	---	---	13-20	Hard	---	---
Throck:											
[1]76	C	None	---	---	>6.0	---	---	40-80	Rippable	---	---
Weswood:											
77	B	Occasional	Brief	Mar-Sep	>6.0	---	---	>60	---	---	---
Winters:											
78, 79, 80	C	None	---	---	>6.0	---	---	>60	---	---	---
[1]81:											
Winters part	C	None	---	---	>6.0	---	---	>60	---	---	---
Urban land part.											

[1]This map unit is made up of two or more dominant kinds of soil. See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 18.--ENGINEERING INDEX TEST DATA

[Dashes indicate data were not available]

Soil name, report number, horizon, and depth in inches	Classification		Grain size distribution										Liquid limit[1]	Plasticity index[1]	Moisture density	Shrinkage		
			Percentage passing sieve							Percentage smaller than--								
	AASHTO	Unified	7/4 inch	5/8 inch	3/8 inch	No. 4	No. 10	No. 40	No. 200	.05 mm	.005 mm	.002 mm				Limit	Linear	Ratio
													Pct		G/cc	Pct	Pct	Pct
Bonti stony fine sandy loam:[2] (71-309, 310 R)																		
A1---------- 0-8	A-2-4	SM-SC	100	99	99	98	98	96	25	21	10	7	19	4	--	17	1.3	1.75
B21t---------11-20	A-6(8)	CL	100	100	100	100	99	98	56	55	48	45	38	20	--	--	--	--
Callahan loam:[3] (71-311, 312 R)																		
B21t---------- 4-19	A-6(9)	CL	100	100	100	99	99	98	62	55	--	--	35	19	--	16	9.7	1.90
B22t----------19-38	A-6(11)	CL	100	100	100	99	97	93	64	58	--	--	38	20	--	13	12.3	1.96
Caradan clay loam:[4] (71-295, 296, 297 R)																		
A1---------- 0-4	A-7-6(19)	CL	100	84	84	83	82	81	76	70	34	28	49	24	--	16	14.6	1.81
B21t---------- 4-18	A-7	CH	100	100	100	99	99	99	97	94	70	63	75	45	--	14	23.3	1.96
C----------36-62	A-6(7)	CL	100	100	100	100	100	90	69	64	36	20	34	11	--	25	4.5	1.65
Deleon silty clay:[5] (74-163, 164, 165 R)																		
A12---------- 8-22	A-7-6(17)	CL	100	100	100	99	97	95	82	72	45	37	47	29	--	14	15.2	1.93
B2t----------22-48	A-7-6(18)	CL	100	100	100	99	98	96	89	82	58	46	48	32	--	11	17.0	2.02
Cca----------48-72	A-7-6(18)	CL	100	100	99	99	97	95	87	80	55	43	48	32	--	11	17.3	2.05
Deleon silty clay:[6] (71-306, 307, 308 R)																		
A11---------- 6-26	A-7-6(35)	CH	100	100	100	100	100	100	99	95	64	48	55	30	--	15	17.6	1.92
A13----------44-66	A-7-6(36)	CH	100	100	100	100	100	100	99	97	67	54	57	32	--	16	17.8	1.95
C----------66-90	A-7-6(36)	CH	100	100	100	100	100	100	99	97	67	52	56	32	--	14	18.1	1.98
Desan loamy fine sand:[7] (74-161, 162 R)																		
A2---------- 8-54	A-2-4(0)	SM	100	100	100	100	100	100	14	8	3	3	20	3	--	17	1.2	1.69
B21t---------54-76	A-6(3)	SC	100	100	100	100	100	100	48	36	21	20	27	11	--	16	5.6	1.83
Doudle cobbly loam:[8] (71-298, 299 R)																		
A1---------- 0-6	A-6(5)	CL	100	98	97	94	91	83	52	47	14	8	32	14	--	20	6.0	1.74
B22ca---------13-36	A-4(4)	CL-ML	100	98	98	96	95	90	79	74	16	10	28	7	--	23	2.7	1.72
Nukrum silty clay:[9] (74-156, 157 R)																		
A1---------- 6-24	A-7-6(16)	CL	100	100	100	100	100	100	93	86	55	47	46	27	--	12	16.2	2.01
B2----------24-56	A-7-6(17)	CL	100	100	100	100	100	99	93	85	56	48	47	30	--	13	15.7	2.00

Pedernales fine sandy loam:[10] (71-314, 315, 316R)																	
A1---------- 0-14	A-2-4	SM-SC	100	100	100	100	100	99	35	26	6	4	18	4	--	16	1.1	1.80
B21t---------14-29	A-6(10)	CL	100	100	100	100	100	99	52	48	37	35	39	23	--	15	11.6	1.86
Cca----------37-60	A-6(14)	CL	100	100	100	100	100	99	74	68	40	27	34	21	--	11	11.7	2.03
Rochelle fine sandy loam:[11] (74-153, 154, 155R)																	
A1---------- 0-8	A-4(1)	SM-SC	100	100	98	95	93	81	39	31	13	9	21	7	--	14	4.2	1.91
B22t---------18-32	A-2-6(1)	SC	86	74	71	68	64	52	29	25	17	16	31	19	--	12	10.4	1.99
Cca----------32-60	A-2-4(0)	GM-GC	78	58	46	34	24	16	8	7	3	2	22	7	--	13	4.7	1.92
Throck stony clay loam:[12] (71-301, 302 R)																	
B---------- 5-14	A-7-6(18)	CL	100	96	93	92	90	86	75	68	44	33	47	24	--	19	12.6	1.83
C----------14-28	A-7-6(20)	CL	100	100	100	99	98	94	81	78	51	38	45	25	--	17	12.8	1.83
Throck stony clay loam:[13] (74-158, 159, 160R)																	
A1---------- 0-8	A-6(9)	CL	100	93	89	83	78	74	64	58	36	28	37	19	--	15	11.3	1.88
B2ca--------- 8-32	A-6(12)	CL	100	100	100	99	99	98	89	80	47	36	37	20	--	15	11.4	1.91
C----------32-60	A-6(10)	CL	100	100	100	99	99	98	79	68	33	25	30	14	--	15	8.1	1.89

[1] Liquid limit and plasticity index values were determined by the AASHTO-89 and AASHTO-90 methods, except that soil was added to water.

[2] Bonti stony fine sandy loam:
0.4 mile north of intersection of Farm Road 485 and Farm Road 2492 in rangeland.

[3] Callahan loam:
from junction of Farm Road 2940 and Texas Highway 279, 0.9 mile north, 800 feet east, and 300 feet north in pasture.

[4] Caradan clay loam:
from junction of Texas Highway 16 and U.S. Highway 16, 7.6 miles north, 2.0 miles east, and 975 feet northeast in rangeland.

[5] Deleon silty clay:
from Mills County Courthouse, 12.2 miles south to county road, and 300 feet southwest.

[6] Deleon silty clay:
from the intersection of Farm Road 2126 and Farm Road 2524, 4.0 miles southeast, 1.9 miles northeast, 0.8 mile southeast on county road, 0.4 mile south on private road, and 3,300 feet south in cultivated field.

[7] Desan loamy fine sand:
from Mills County Courthouse, 10 miles southeast on Texas Highway 16, 1.3 miles west, 0.5 mile north, 0.5 mile east, and 240 feet southeast.

[8] Doudle cobbly loam:
from the intersection of Farm Road 45 and Indian Creek Road, 0.1 mile north on Farm Road 45, 0.8 mile northeast, 0.5 mile southeast, and 200 feet southwest in rangeland.

[9] Nukrum silty clay:
from Brown County Courthouse, 2.5 miles south on U.S. Highway 377, 0.7 mile southwest, and 600 feet south in cultivated field.

[10] Pedernales fine sandy loam:
from Owens, Texas, 0.8 mile northeast, 0.95 mile east, and 100 feet north on wooded rangeland.

[11] Rochelle fine sandy loam:
from the intersection of U.S. Highway 183 and U.S. Highway 77, 1.4 miles north, 0.4 mile east, and 30 feet south.

[12] Throck stony clay loam:
from intersection of U.S. Highway 377 and Farm Road 1176, 4 miles west, 3 miles north, and 300 feet north.

[13] Throck stony clay loam:
from intersection of Farm Road 2525 and Farm Road 2126, 1.3 miles northeast, and 125 feet west.

TABLE 19.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Abilene	Fine, mixed, thermic Pachic Argiustolls
Bastrop	Fine-loamy, mixed, thermic Udic Paleustalfs
Bolar	Fine-loamy, carbonatic, thermic Typic Calciustolls
Bonti	Fine, mixed, thermic Ultic Paleustalfs
Bosque	Fine-loamy, mixed, thermic Cumulic Haplustolls
Brackett	Loamy, carbonatic, thermic, shallow Typic Ustochrepts
Callahan	Fine, mixed, thermic Typic Haplustalfs
Caradan	Very-fine, montmorillonitic, thermic Udertic Paleustalfs
Chaney	Fine, mixed, thermic Aquic Paleustalfs
Cisco	Fine-loamy, siliceous, thermic Udic Haplustalfs
Clairemont	Fine-silty, mixed (calcareous), thermic Typic Ustifluvents
Deleon	Fine, mixed, thermic Udertic Haplustolls
Denton	Fine, montmorillonitic, thermic Vertic Calciustolls
Desan	Loamy, siliceous, thermic Grossarenic Paleustalfs
Doudle	Coarse-loamy, carbonatic, thermic Typic Ustochrepts
Energy	Fine-loamy, mixed (calcareous), thermic Typic Ustifluvents
Frio	Fine, mixed, thermic Cumulic Haplustolls
Heaton	Loamy, siliceous, thermic Arenic Paleustalfs
Hext	Coarse-loamy, mixed, thermic Typic Ustochrepts
Kavett	Clayey, montmorillonitic, thermic, shallow Petrocalcic Calciustolls
Krum	Fine, montmorillonitic, thermic Vertic Haplustolls
Leeray	Fine, montmorillonitic, thermic Typic Chromusterts
Lindy	Fine, mixed, thermic Udic Haplustalfs
May	Fine-loamy, mixed, thermic Udic Haplustalfs
Menard	Fine-loamy, mixed, thermic Typic Haplustalfs
Mereta	Clayey, mixed, thermic, shallow Petrocalcic Calciustolls
Miller	Fine, mixed, thermic Vertic Haplustolls
Nimrod	Loamy, siliceous, thermic Aquic Arenic Paleustalfs
Nukrum	Fine, mixed, thermic Vertic Haplustolls
Nuvalde	Fine-silty, mixed, thermic Typic Calciustolls
Patilo	Loamy, siliceous, thermic Grossarenic Paleustalfs
Pedernales	Fine, mixed, thermic Udic Paleustalfs
Real	Loamy-skeletal, carbonatic, thermic, shallow Typic Calciustolls
Rochelle	Fine-loamy, mixed, thermic Typic Haplustalfs
Rowena	Fine, mixed, thermic Vertic Calciustolls
Sagerton	Fine, mixed, thermic Typic Paleustolls
Speck	Clayey, mixed, thermic Lithic Argiustolls
Sunev	Fine-loamy, carbonatic, thermic Typic Calciustolls
Tarpley	Clayey, montmorillonitic, thermic Lithic Vertic Argiustolls
Tarrant	Clayey-skeletal, montmorillonitic, thermic Lithic Calciustolls
Throck	Fine, mixed, thermic Typic Ustochrepts
Weswood	Fine-silty, mixed, thermic Fluventic Ustochrepts
Winters	Fine, mixed, thermic Udic Paleustalfs

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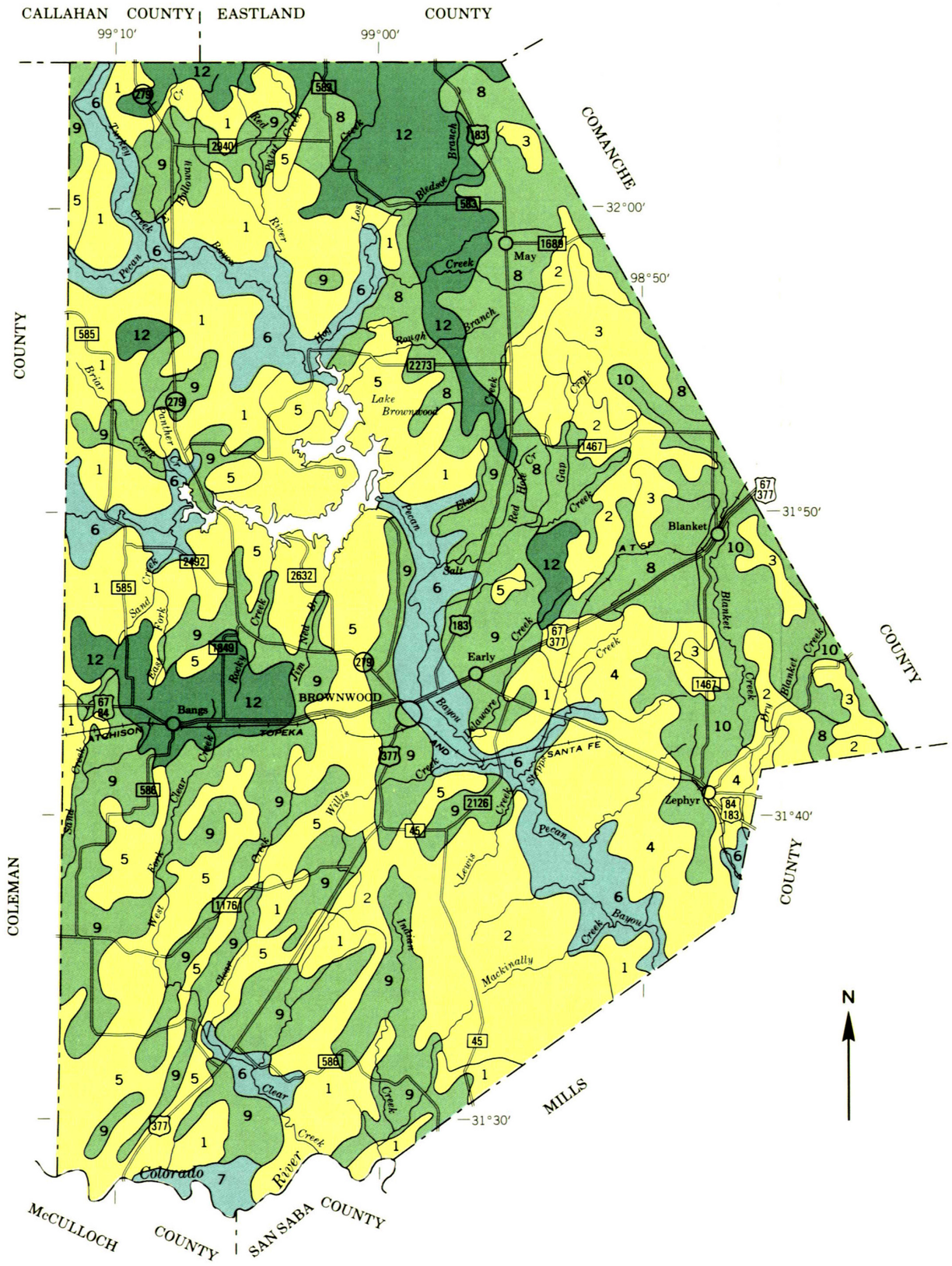


LEGEND *

(Not all soil units appear in both counties.)

VERY SHALLOW TO DEEP, LOAMY AND CLAYEY SOILS ON UPLANDS

1 — Callahan-Throck-Bonti: Gently sloping to hilly, moderately deep to deep, stony, loamy soils over sandstone or shale

2 — Bolar-Brackett: Gently sloping to hilly, shallow to moderately deep, gravelly, loamy soils over limestone

3 — Tarrant-Tarpley: Gently sloping to hilly, very shallow to shallow, cobbly and stony, clayey and loamy soils over limestone

4 — Doudle-Real: Gently sloping to hilly, shallow to moderately deep, gravelly and cobbly, loamy soils over limestone and loamy sediment

5 — Speck-Tarrant: Gently sloping, shallow to very shallow, stony, loamy and clayey soils over limestone

DEEP, LOAMY AND CLAYEY SOILS ON FLOOD PLAINS AND UPLANDS

6 — Frio-Sunev-Winters: Nearly level to gently sloping, deep, loamy soils over loamy and clayey alluvium

7 — Weswood-Clairemont: Nearly level, deep, loamy soils over loamy alluvium

MODERATELY DEEP AND DEEP, LOAMY AND CLAYEY SOILS ON UPLANDS

8 — Pedernales-Menard-Hext: Gently sloping to sloping, moderately deep to deep, loamy soils over loamy sediment

9 — Leeray-Sagerton-Nukrum: Nearly level to gently sloping, deep, loamy and clayey soils over clayey or loamy sediment

10 — Krum-Bolar-Denton: Gently sloping, moderately deep to deep, clayey and loamy soils over limestone or clayey sediment

11 — Bastrop-Winters-Sagerton: Nearly level to gently sloping, deep, loamy soils over loamy sediment

DEEP, SANDY AND LOAMY SOILS ON UPLANDS

12 — Pedernales-Nimrod-Chaney: Nearly level to gently sloping, deep, sandy and loamy soils over loamy sediment or soft sandstone

*Terms for texture refer to the surface layer of the major soils in each map unit.

Compiled 1979

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
TEXAS AGRICULTURAL EXPERIMENT STATION

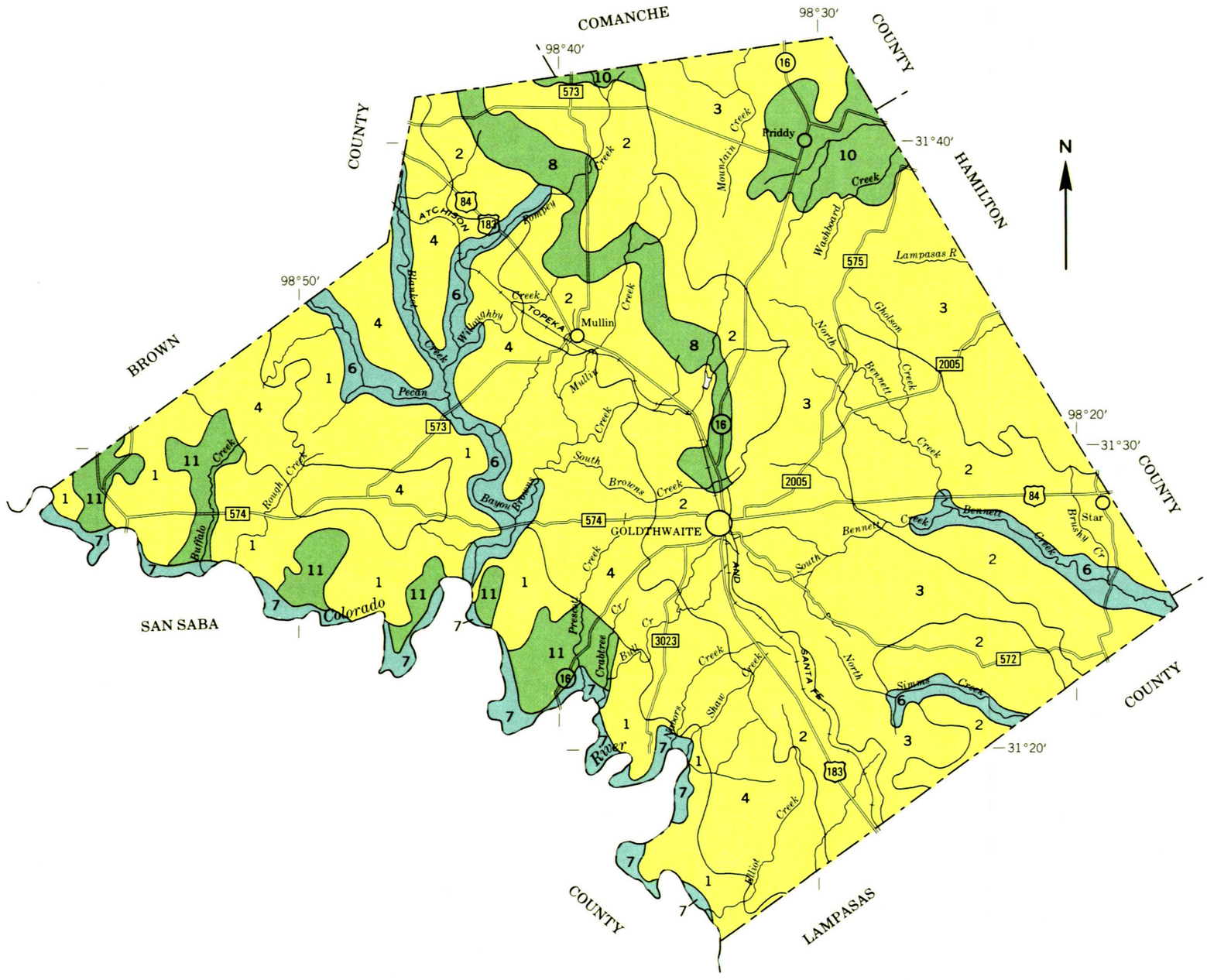
GENERAL SOIL MAP

BROWN COUNTY, TEXAS

Scale 1:316,800

1 0 1 2 3 4 5 Miles

1 0 5 10 Km



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DEEP, SANDY AND LOAMY SOILS ON UPLANDS

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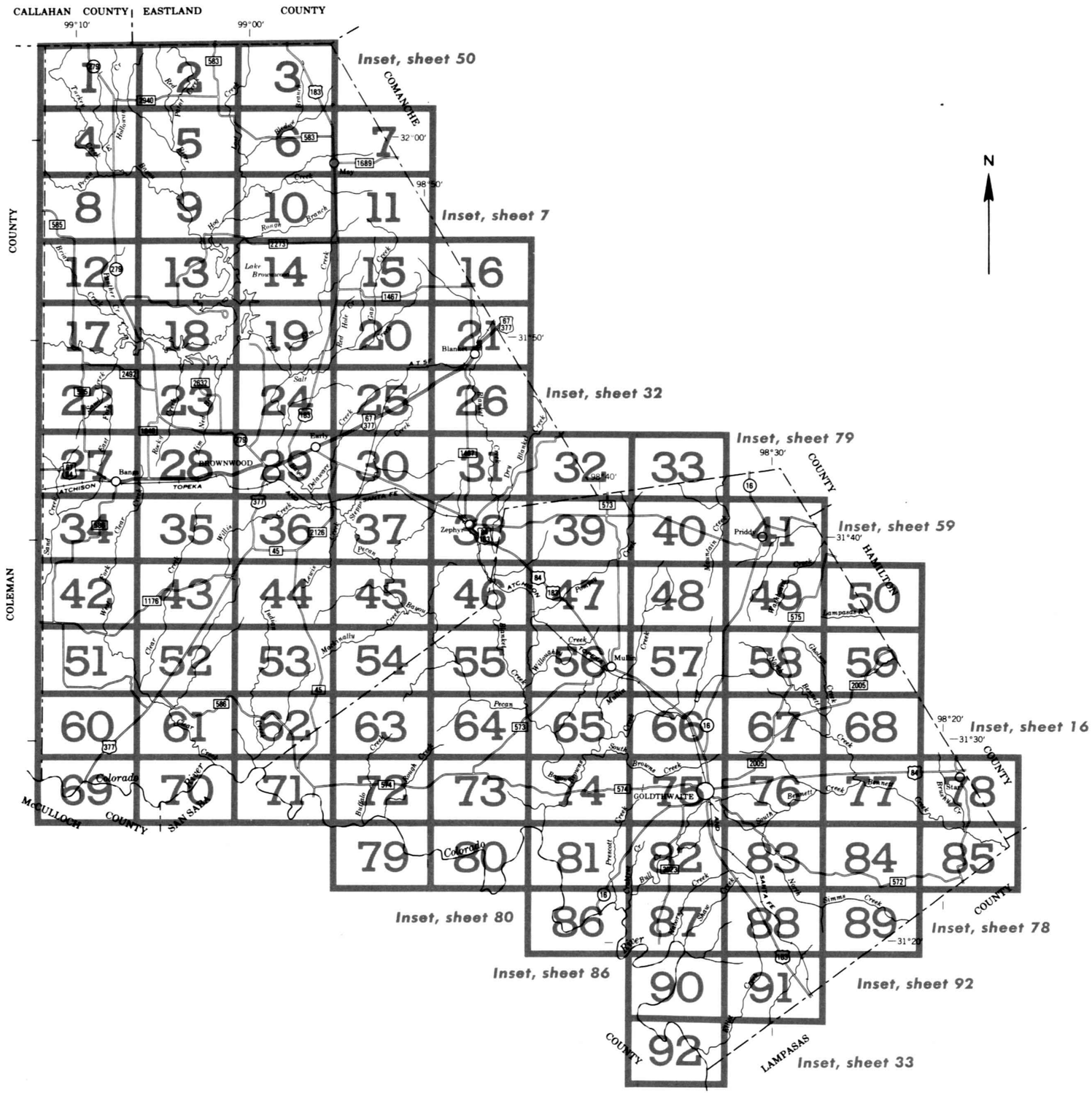
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
TEXAS AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP
MILLS COUNTY, TEXAS

Scale 1:316,800

1 0 1 2 3 4 5 Miles

1 0 5 10 Km



INDEX TO MAP SHEETS

BROWN & MILLS COUNTIES, TEXAS

Scale 1:443,520

1 0 1 2 3 4 5 6 7 Miles

0 5 10 Km

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- National, state or province
- County or parish
- Minor civil division
- Reservation (national forest or park, state forest or park, and large airport)
- Land grant
- Limit of soil survey (label)
- Field sheet matchline & neatline

AD HOC BOUNDARY (label) — Hedley Airstrip

Small airport, airfield, park, oilfield, cemetery, or flood pool — FLOOD POOL LINE

STATE COORDINATE TICK

LAND DIVISION CORNERS (sections and land grants)

ROADS

- Divided (median shown if scale permits)
- Other roads
- Trail

ROAD EMBLEM & DESIGNATIONS

- Interstate — 21
- Federal — 173
- State — 28
- County, farm or ranch — 1283

RAILROAD

POWER TRANSMISSION LINE (normally not shown)

PIPE LINE (normally not shown)

FENCE (normally not shown)

LEVEES

- Without road
- With road
- With railroad

DAMS

- Large (to scale)
- Medium or small — water — w

PITS

- Gravel pit
- Mine or quarry

MISCELLANEOUS CULTURAL FEATURES

- Farmstead, house (omit in urban areas)
- Church
- School
- Indian mound (label) — Indian Mound
- Located object (label) — Tower
- Tank (label) — Gas
- Wells, oil or gas
- Windmill
- Kitchen midden

WATER FEATURES

DRAINAGE

- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end
- Canals or ditches
  - Double-line (label) — CANAL
  - Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

- Perennial — water — w
- Intermittent — int — i

MISCELLANEOUS WATER FEATURES

- Marsh or swamp
- Spring
- Well, artesian
- Well, irrigation
- Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS — CnB | WaC2

ESCARPMENTS

- Bedrock (points down slope)
- Other than bedrock (points down slope)

SHORT STEEP SLOPE

GULLY

DEPRESSION OR SINK

SOIL SAMPLE SITE (normally not shown) — S

MISCELLANEOUS

- Blowout
- Clay spot
- Gravelly spot
- Gumbo, slick or scabby spot (sodic)
- Dumps and other similar non soil areas
- Prominent hill or peak
- Rock outcrop (includes sandstone and shale)
- Saline spot
- Sandy spot
- Severely eroded spot
- Slide or slip (tips point upslope)
- Stony spot, very stony spot

SOIL LEGEND

Soil names followed by the superscript 1/ are broadly defined units. The composition of these units is more variable than that of the others in the survey area but has been controlled well enough to be interpreted for the expected use of the soils.

SYMBOL	NAME
1	Abilene clay loam, 0 to 1 percent slopes
2	Abilene clay loam, 1 to 3 percent slopes
3	Abilene-Urban land complex, 0 to 2 percent slopes
4	Bastrop fine sandy loam, 1 to 3 percent slopes
5	Bolar clay loam, 2 to 5 percent slopes
6	Bolar-Brackett association, undulating 1/
7	Bonti fine sandy loam, 1 to 3 percent slopes
8	Bonti fine sandy loam, 2 to 5 percent slopes, eroded
9	Bonti-Urban land complex, 1 to 5 percent slopes
10	Bonti-Callahan association, undulating 1/
11	Bonti-Throck association, hilly 1/
12	Bosque loam, occasionally flooded
13	Brackett association, undulating 1/
14	Brackett-Tarrant association, hilly 1/
15	Callahan loam, 1 to 3 percent slopes
16	Callahan loam, 1 to 5 percent slopes, eroded
17	Callahan-Urban land complex, 1 to 5 percent slopes
18	Callahan-Throck association, undulating 1/
19	Caradan clay loam, 1 to 3 percent slopes
20	Chaney loamy fine sand, 1 to 5 percent slopes
21	Cisco loamy fine sand, 1 to 3 percent slopes
22	Cisco fine sandy loam, 1 to 3 percent slopes
23	Cisco fine sandy loam, 2 to 5 percent slopes, eroded
24	Clairemont soils, frequently flooded 1/
25	Deleon silty clay
26	Deleon-Urban land complex, 0 to 1 percent slopes
27	Denton silty clay, 1 to 3 percent slopes
28	Desan loamy fine sand, 0 to 5 percent slopes
29	Doudle-Real association, undulating 1/
30	Energy fine sandy loam, occasionally flooded
31	Frio silty clay loam, occasionally flooded
32	Frio silty clay loam, frequently flooded
33	Frio-Urban land complex, 0 to 1 percent slopes
34	Heaton loamy fine sand, 0 to 3 percent slopes
35	Hext loam, 1 to 3 percent slopes
36	Hext loam, 3 to 5 percent slopes
37	Hext-Brackett complex, 1 to 8 percent slopes
38	Kavett silty clay, 1 to 3 percent slopes
39	Krum silty clay, 1 to 3 percent slopes
40	Leeray clay, 0 to 1 percent slopes
41	Leeray clay, 1 to 3 percent slopes
42	Lindy clay loam, 1 to 3 percent slopes
43	May fine sandy loam, 0 to 1 percent slopes
44	May fine sandy loam, 1 to 3 percent slopes
45	Menard fine sandy loam, 1 to 3 percent slopes
46	Menard fine sandy loam, 3 to 5 percent slopes
47	Menard fine sandy loam, 2 to 5 percent slopes, eroded
48	Menard fine sandy loam, 5 to 8 percent slopes
49	Menard-Hext association, gently undulating 1/
50	Mereta clay loam, 1 to 3 percent slopes
51	Miller silty clay, occasionally flooded
52	Nimrod fine sand, 0 to 5 percent slopes
53	Nukrum silty clay, 1 to 3 percent slopes
54	Nukrum-Urban land complex, 1 to 4 percent slopes
55	Nuvalde clay loam, 1 to 3 percent slopes
56	Patilo fine sand, 1 to 5 percent slopes
57	Pedernales loamy fine sand, 1 to 5 percent slopes
58	Pedernales fine sandy loam, 1 to 3 percent slopes
59	Pedernales fine sandy loam, 3 to 5 percent slopes
60	Pedernales fine sandy loam, 2 to 5 percent slopes, eroded
61	Real association, hilly 1/
62	Real-Tarrant association, hilly 1/
63	Rochelle fine sandy loam, 1 to 5 percent slopes
64	Rowena clay loam, 0 to 1 percent slopes
65	Rowena clay loam, 1 to 3 percent slopes
66	Sagerton clay loam, 0 to 1 percent slopes
67	Sagerton clay loam, 1 to 3 percent slopes
68	Sagerton-Urban land complex, 0 to 3 percent slopes
69	Speck clay loam, 1 to 3 percent slopes
70	Speck-Urban land complex, 1 to 3 percent slopes
71	Speck-Tarrant association, gently undulating 1/
72	Sunev clay loam, 1 to 3 percent slopes
73	Tarpley clay loam, 1 to 3 percent slopes
74	Tarpley-Tarrant association, gently undulating 1/
75	Tarrant-Tarpley association, undulating 1/
76	Throck association, hilly 1/
77	Weswood silt loam, occasionally flooded
78	Winters fine sandy loam, 0 to 1 percent slopes
79	Winters fine sandy loam, 1 to 3 percent slopes
80	Winters fine sandy loam, 2 to 5 percent slopes, eroded
81	Winters-Urban land complex, 1 to 3 percent slopes

BROWN AND MILLS COUNTIES, TEXAS — SHEET NUMBER 1

2 355 000 FEET

CALLAHAN COUNTY

EASTLAND COUNTY

875 000 FEET

COLEMAN COUNTY

Turkey Creek

water

Cross Cut

Holloway

East

2940

(Joins sheet 2)

(Joins sheet 4)

2 380 000 FEET

860 000 FEET

N

10000 Feet

3 Kilometers

Scale - 1:24 000

This map is compiled on 1975 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BROWN AND MILLS COUNTIES, TEXAS — SHEET NUMBER 2

(2)

N

EASTLAND COUNTY

2 410 000 FEET

875 000 FEET

Red River

Creek

Paint Creek

Lost Creek

water

(Joins sheet 1)

(Joins sheet 3)

(Joins sheet 5)

2 385 000 FEET

860 000 FEET

583

2940

10 000 Feet

3 Kilometers

5 000

2

Scale - 1:24 000

0

.5

1

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BROWN AND MILLS COUNTIES, TEXAS — SHEET NUMBER 3

2 415 000 FEET

EASTLAND COUNTY

COMANCHE COUNTY

QUARRY

875 000 FEET

(Joins sheet 2)

(Joins inset, sheet 50)

(Joins sheet 6)

2 440 000 FEET

860 000 FEET

Bledsoe Branch

183

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Coordinate grid ticks and land division corners, if shown, are approximately positioned.

3

N

10000 Feet

3 Kilometers

5000 0 1000 2000 3000 4000 5000

Scale 1:24000

BROWN AND MILLS COUNTIES, TEXAS — SHEET NUMBER 4

(4)

N

10000 Feet

3 Kilometers

5000

2

Scale - 1:24000

1

0

.5

0

1000

2000

3000

4000

5000

(Joins sheet 1)

2 380 000 FEET

860 000 FEET

845 000 FEET

(Joins sheet 8)

2 355 000 FEET

(Joins sheet 5)

COUNTY

COLEMAN

Turkey Creek

West Hollaway Creek

Hollaway Creek

East Creek

Creek

Pecan Bayou

Bowden Hollow

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BROWN AND MILLS COUNTIES, TEXAS — SHEET NUMBER 5

2 385 000 FEET

860 000 FEET

(Joins sheet 2)

(Joins sheet 4)

(Joins sheet 6)

(Joins sheet 9)

2 410 000 FEET

845 000 FEET

Red River

Lost Creek

Williams

water

5

N

10000 Feet 3 Kilometers

5000 0 1000 2000 3000 4000 5000

Scale - 1:24 000

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Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BROWN AND MILLS COUNTIES, TEXAS — SHEET NUMBER 6

6

N

(Joins sheet 3)

2 440 000 FEET

855 000 FEET

845 000 FEET

(Joins sheet 5)

(Joins sheet 7)

(Joins sheet 10)

2 415 000 FEET

Scale - 1:24 000

10,000 Feet

3 Kilometers

Branch

Bledsoe

Creek

Lost

Creek

Hog

May

GRAVEL PIT

583

183

1689

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Coordinate grid ticks and grid lines are approximately positioned

BROWN AND MILLS COUNTIES, TEXAS — SHEET NUMBER 7

7

2 440 000 FEET

(Joins inset, sheet 50)

860 000 FEET

(Joins sheet 6)

COMANCHE

COUNTY

Rattlesnake Gap

GRAVEL PIT

1689

(Joins sheet 11)

2 465 000 FEET

845 000 FEET

N

10000 Feet

3 Kilometers

5000

2

1

0

5000 4000 3000 2000 1000 0

.5

1

Scale - 1:24 000

2 470 000 FEET

827 000 FEET

822 000 FEET

(Joins sheet 11)

(Joins sheet 16)

2 473 000 FEET

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Coordinate grid ticks and land division corners, if shown, are approximately positioned.

(8)

(Joins sheet 4)

2 380 000 FEET

840 000 FEET

COUNTY

COLEMAN

Pecan Bayou

Bowden

Hollow

Bayou

Branch

HOLLOWAY

MOUNTAIN

Pasture

Cottonwood

585

279

825 000 FEET

(Joins sheet 9)

(Joins sheet 12)

2 355 000 FEET

N

10 000 Feet

3 Kilometers

5 000

2

1

0

5 000 4 000 3 000 2 000 1 000 0

1 .5 0

Scale - 1:24 000

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BROWN AND MILLS COUNTIES, TEXAS — SHEET NUMBER 9

2 385 000 FEET

840 000 FEET

(Joins sheet 5)

(Joins sheet 8)

(Joins sheet 10)

(Joins sheet 13)

2 410 000 FEET

825 000 FEET

N

Red

Pecan

Bayou

River

Pecan

Bayou

Byrds

Hod

Creek

Creek

Creek

Lost

Lost

Rough

Branch

2559

2273

2273

10000 Feet 0 1 2

3 Kilometers 0 .5 1

5 000 4 000 3 000 2 000 1 000 0

Scale - 1:24 000

BROWN AND MILLS COUNTIES, TEXAS — SHEET NUMBER 10

(10)

N

Scale - 1:24000

10000 Feet 3 Kilometers

5000 2 0

5000 4000 3000 2000 1000 0 .5 1

(Joins sheet 6)

(Joins sheet 9)

(Joins sheet 11)

(Joins sheet 14)

2 440 000 FEET

840 000 FEET

825 000 FEET

2 415 000 FEET

Lost Creek

Hog Creek

Hog Creek

Rough Branch

Elm Creek

2273

2243

183

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BROWN AND MILLS COUNTIES, TEXAS — SHEET NUMBER 11

2 440 000 FEET

840 000 FEET

(Joins sheet 7)

(Joins sheet 10)

(Joins inset, sheet 7)

2 465 000 FEET

(Joins sheet 15)

825 000 FEET

COMANCHE

COUNTY

HOG

MOUNTAIN

Hog Creek

water

Creek

Gap

Creek

Elm Creek

Jimmy's Creek

N

10000 Feet

3 Kilometers

5000

2

1

Scale - 1:24000

0 1000 2000 3000 4000 5000

0 .5 1

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Coordinate grid ticks and division corners, if shown, are approximately positioned.

BROWN AND MILLS COUNTIES, TEXAS — SHEET NUMBER 12

(12)

N

Scale - 1:24000

10,000 Feet 3 Kilometers

(Joins sheet 8)

2 380 000 FEET

820 000 FEET

COUNTY

COLEMAN

805 000 FEET

(Joins sheet 13)

(Joins sheet 17) 2 335 000 FEET

Brier Creek

Panther Creek

Grosvenor

Dry Creek

This map is compiled on 1975 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned

2 385 000 FEET

820 000 FEET

(Joins sheet 9)

(Joins sheet 12)

(Joins sheet 14)

(Joins sheet 18)

2 410 000 FEET

805 000 FEET

Hog Creek

Pecan Bayou

Rough Branch

LAKE

BROWNWOOD

Goat Island

13

N

10000 Feet 3 Kilometers

5000 0 5000 4000 3000 2000 1000 0 .5 1

Scale - 1:24 000

BROWN AND MILLS COUNTIES, TEXAS — SHEET NUMBER 14

(14)

N

(Joins sheet 10)

2 440 000 FEET

820 000 FEET

(Joins sheet 13)

805 000 FEET

(Joins sheet 15)

(Joins sheet 19)

2 415 000 FEET

10,000 Feet

3 Kilometers

Scale - 1:24 000

LAKE BROWNWOOD

Elm Creek

Elm Creek

Plm Creek

This map is compiled on 1975 aerial photography by the U.S. Department of Agriculture. Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned

BROWN AND MILLS COUNTIES, TEXAS — SHEET NUMBER 15

15

2 440 000 FEET

820 000 FEET

(Joins sheet 11)

(Joins sheet 14)

(Joins sheet 16)

(Joins sheet 20)

2 470 000 FEET

805 000 FEET

N

STAR MOUNTAIN

SALT MOUNTAIN

Little Jimmys Creek

Gap Creek

Blankett Creek

Hole Creek

Red Branch

Berry Creek

Cap Creek

Salt Creek

1467

Scale 1:24 000

10 000 Feet 5 000

3 Kilometers 2 1 0 1

This map is compiled on 1975 aerial photography by the U.S. Department of Agriculture. Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

16

N

10000 Feet 3 Kilometers

5000 2

Scale - 1:24000

0 0

1000 .5

2000

3000 1

4000

5000

(Joins inset, sheet 7)

2 480 000 FEET

820 000 FEET

STAR

MOUNTAIN

COMANCHE

Little Jimmys Creek

(Joins sheet 15)

805 000 FEET

Blankel

Creek

water

COUNTY

1467

2 470 000 FEET

(Joins sheet 21)

2 625 000 FEET

580 000 FEET

APPROXIMATE

HAMILTON

South Leonpasas River

(Joins sheet 68)

670 000 FEET

COUNTY

Hurst Gap

1047

2 620 000 FEET

(Joins sheet 78)

BROWN AND MILLS COUNTIES, TEXAS — SHEET NUMBER 17

2 355 000 FEET

800 000 FEET

(Joins sheet 12)

(Joins sheet 18)

(Joins sheet 22)

2 380 000 FEET

285 000 FEET

COLEMAN COUNTY

INDIAN MOUNTAIN

LAKE BROWNWOOD

Keeler Knob

Thrifty

Jim Ned Creek

Jim Ned Creek

Mud Creek

Love Branch

Briar Creek

Panther Creek

Dry Creek

Creek

Sand Creek

Short Creek

585

279

2492

N

17

10000 Feet 5000 0 1 2 3 Kilometers

Scale 1:24 000

18

N

Scale - 1:24000

10,000 Feet 3 Kilometers

5 000 4000 3000 2000 1000 0 .5 0 1 2

(Joins sheet 13)

(Joins sheet 17)

(Joins sheet 19)

(Joins sheet 23)

2 410 000 FEET

800 000 FEET

785 000 FEET

2 385 000 FEET

LAKE BROWNWOOD

BROWNWOOD STATE PARK

McCartney Island

Lake Shore

Creek

Rough Creek

Carson Cove

This map is compiled on 1975 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BROWN AND MILLS COUNTIES, TEXAS — SHEET NUMBER 19

2 415 000 FEET

800 000 FEET

(Joins sheet 14)

LAKE BROWNWOOD

Buzzard Bay

Mc Cartney Island

Pecan Bayou

Pecan Creek

Bayou Creek

Elm Creek

Red Hole Creek

Owens

Red Elm Creek

Salt Creek

(Joins sheet 18)

(Joins sheet 20)

(Joins sheet 24)

2 440 000 FEET

785 000 FEET

19

N

10000 Feet 5000

3 Kilometers 2 1 0

Scale 1:24 000

5 000 4 000 3 000 2 000 1 000 0

20

N

(Joins sheet 15)

2 470 000 FEET

2 800 000 FEET

(Joins sheet 19)

(Joins sheet 21)

(Joins sheet 25)

2 445 000 FEET

2 785 000 FEET

Red Hole Creek

Branch

Creek

Gap

Salt

Creek

water

10000 Feet 3 Kilometers

5000 2 1

Scale - 1:24 000

5000 4000 3000 2000 1000 0 .5 0 1

This map is compiled on 1975 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned

BROWN AND MILLS COUNTIES, TEXAS — SHEET NUMBER 21

2 470 000 FEET

(Joins sheet 16)

800 000 FEET

(Joins sheet 20)

(Joins sheet 26)

2 495 000 FEET

785 000 FEET

N

Blankett Creek

COMANCHE

SANTA FE

GRAVEL PIT

Blankett

TOPEKA AND

ATCHISON

COUNTY

67 377

1467

10000 Feet 3 Kilometers

5 000 4 000 3 000 2 000 1 000 0

5 000 2 1 0 .5 1

Scale - 1:24 000

22

N

Scale - 1:24000

10000 Feet 5000 0 1000 2000 3000 4000 5000

3 Kilometers 2 1 0 .5 1

(Joins sheet 17)

2 380 000 FEET

780 000 FEET

765 000 FEET

2 355 000 FEET

COUNTY

COLEMAN

MAYBERRY

MOUNTAIN

Thrifty

water

Branch

Love

Sand

Creek

East Fork

Gobbler Hollow

(Joins sheet 23)

(Joins sheet 27)

This map is compiled on 1975 aerial photography by the U.S. Department of Agriculture. Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned

BROWN AND MILLS COUNTIES, TEXAS — SHEET NUMBER 23

2 385 000 FEET

(Joins sheet 18)

LAKE BROWN WOOD

Rocky Creek

Rough Creek

Rocky Creek

Jim Ned Creek

Branch

(Joins sheet 22)

(Joins sheet 24)

(Joins sheet 28)

2 410 000 FEET

765 000 FEET

N

Scale - 1:24 000

10000 Feet 5000 0 1000 2000 3000 4000 5000

3 Kilometers 2 1 0 .5 1

(24)

N

Scale - 1:24000

10000 Feet 3 Kilometers

5000 2

1 1000

0 0

1000 .5

2000

3000

4000

5000

(Joins sheet 19)

2 440 000 FEET

780 000 FEET

(Joins sheet 23)

(Joins sheet 25)

765 000 FEET

(Joins sheet 29)

2 415 000 FEET

Brownwood Municipal Airport

Bayou

Salt Creek

Red Hole Creek

Pecan Bayou

Pecan

GRAVEL PIT

water

This map is compiled on 1975 aerial photography by the U.S. Department of Agriculture. Soil Conservation Service and cooperating agencies
Coordinate grid ticks and land division corners, if shown, are approximately positioned

BROWN AND MILLS COUNTIES, TEXAS — SHEET NUMBER 25

2 445 000 FEET

(Joins sheet 20)

780 000 FEET

(Joins sheet 24)

(Joins sheet 26)

(Joins sheet 30)

2 470 000 FEET

765 000 FEET

25

N

10000 Feet

3 Kilometers

Scale 1:24 000

5000 4000 3000 2000 1000 0 5000 2000 1 0 .5 1

Creek

Delaware

Stephens

Stephens

North Fork

TOPEKA

SANTA FE

GRAVEL PIT

GRAVEL PIT

QUARRY

water

67 377

3100

This map is compiled on 1975 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies
Coordinate grid ticks and land division corners, if shown, are approximately positioned

N

(Joins sheet 21)

2 495 000 FEET

780 000 FEET

Blanket

COMANCHE COUNTY

water

Creek

GRAVEL PIT

water

765 000 FEET

2 470 000 FEET

(Joins sheet 31)

(Joins inset, sheet 32)

(Joins sheet 25)

10000 Feet 3 Kilometers

5000 2

1000 1

Scale - 1:24000

5000 4000 3000 2000 1000 0 .5 0 1

This map is compiled on 1975 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned

BROWN AND MILLS COUNTIES, TEXAS — SHEET NUMBER 27

27

N

2 355 000 FEET

760 000 FEET

(Joins sheet 22)

(Joins sheet 28)

(Joins sheet 34)

2 380 000 FEET

745 000 FEET

COUNTY

COLEMAN

Creek

Sand

Sand

Creek

Creek

TOPEKA AND SANTA FE

ATCHISON

Bangs

GRAVEL PIT

10000 Feet 5000

3 Kilometers 2 1 0 1000 2000 3000 4000 5000

Scale - 1:24 000

This map is compiled on 1975 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies
Coordinate grid ticks and land division corners, if shown, are approximately positioned

28

N

Scale - 1:24000

10000 Feet 3 Kilometers 5000 2 1 0 1000 2000 3000 4000 5000 .5 0 1

(Joins sheet 23)

(Joins sheet 27)

(Joins sheet 29)

(Joins sheet 35)

2 410 000 FEET

2 385 000 FEET

760 000 FEET

745 000 FEET

Creek

Branch

Williams

Rocky

Jim

Ned

Clear

Adams

Creek

Branch

QUARRY

ATCHISON

AND

SANTA FE

Airfield

1849

84 67

8254

BROWN AND MILLS COUNTIES, TEXAS — SHEET NUMBER 29

29

2 415 000 FEET

(Joins sheet 24)

260 000 FEET

(Joins sheet 28)

(Joins sheet 30)

(Joins sheet 36)

2 440 000 FEET

2 445 000 FEET

N

Scale - 1:24 000

10000 Feet 5000 0 1000 2000 3000 4000 5000

3 Kilometers 2 1 0 .5 0 1

BROWNWOOD
(county seat)

Early

Williams

Pecan Bayou

Pecan Branch

Williams Branch

Adams Branch

Deleware Creek

Pecan Branch

Bayou

CLAY PIT

LAND FILL

LAND FILL

GRAVEL PIT

This map is compiled on 1975 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies
Coordinate grid ticks and land division corners, if shown, are approximately positioned

30

N

10000 Feet 3 Kilometers

5000 2

Scale - 1:24000

5000 4000 3000 2000 1000 0 .5 0 1

(Joins sheet 25)

(Joins sheet 29)

(Joins sheet 37)

(Joins sheet 31)

2 470 000 FEET

760 000 FEET

2 445 000 FEET

Steppes

Creek

North Fork

East Fork

Rock Creek

TOPEKA AND SANTA FE

ATCHISON TOPEKA

GRAVEL PIT

67 377

84 183

2525

BROWN AND MILLS COUNTIES, TEXAS — SHEET NUMBER 31

2 470 000 FEET

760 000 FEET

(Joins sheet 31)

(Joins sheet 30)

(Joins sheet 32)

(Joins sheet 38)

745 000 FEET

2 500 000 FEET

N

Scale - 1:24 000

10 000 Feet 5 000 0

3 Kilometers 2 1 0

This map is compiled on 1975 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

Scale - 1:24 000

10 000 Feet 3 Kilometers 5 000 2 1 0 0 1 000 2 000 3 000 4 000 5 000 .5 1

(Joins inset)

2 525 000 FEET

2 505 000 FEET

775 000 FEET

760 000 FEET

765 000 FEET

2 500 000 FEET

2 495 000 FEET

(Joins sheet 31)

(Joins sheet 26)

(Joins upper left)

(Joins sheet 33)

(Joins sheet 39)

Turkey Peak Mountain

Spur Mountain

Blanket Creek

Dry Blanket Creek

Dirthouse Branch North Fork

Dirthouse Branch South Fork

Dirthouse

Spring Branch

Sand Spring Branch

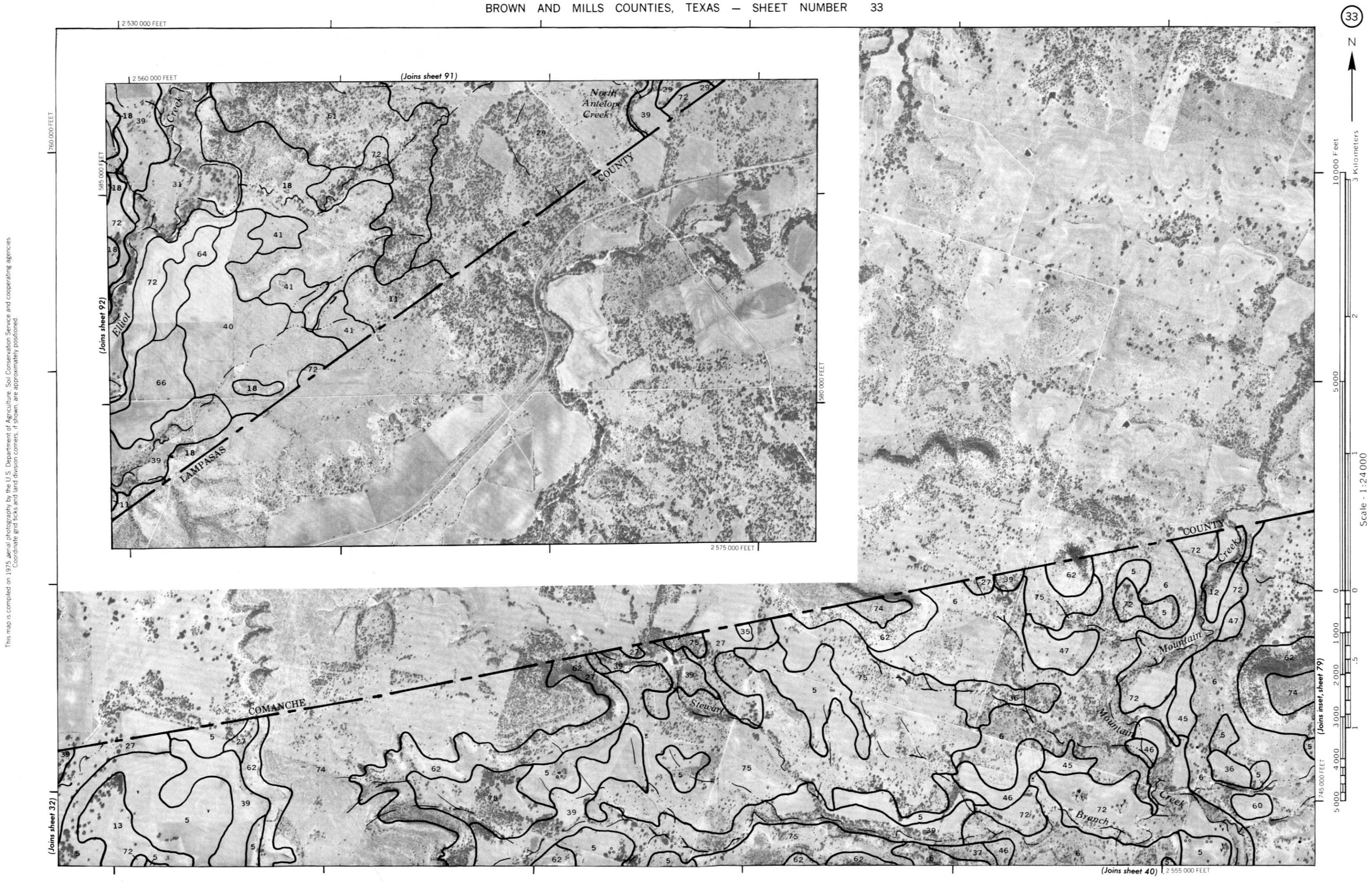
COMANCHE COUNTY

MILLS COUNTY

water

590

573



This map is compiled on 1975 aerial photography by the U.S. Department of Agriculture. Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

34

(Joins sheet 27)

2 380 000 FEET

740 000 FEET

N

10000 Feet
3 Kilometers

5 000 4 000 3 000 2 000 1 000 0
2 1 .5 0

Scale - 1:24 000

COUNTY

COLEMAN

Creek

Sand

Creek

Sand

Creek

Clear Fork West

586

725 000 FEET

(Joins sheet 42)

2 355 000 FEET

(Joins sheet 35)

This map is compiled on 1975 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies
Coordinate grid ticks and land division corners, if shown, are approximately positioned

BROWN AND MILLS COUNTIES, TEXAS — SHEET NUMBER 35

35

2 385 000 FEET

740 000 FEET

(Joins sheet 28)

(Joins sheet 34)

(Joins sheet 36)

(Joins sheet 43)

2 410 000 FEET

N

Clear Creek

Clear Creek

Creek water

Willis

GRAVEL PIT

10000 Feet

3 Kilometers

5 000

25 000 FEET

Scale - 1:24 000

This map is compiled on 1975 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned

36

N

(Joins sheet 29)

2 440 000 FEET

740 000 FEET

(Joins sheet 35)

725 000 FEET

(Joins sheet 44) 2 415 000 FEET

(Joins sheet 37)

10 000 Feet 5 000 0

3 Kilometers 2 1 0

Scale - 1:24 000

ROUND MOUNTAIN

QUARRY

BROWNWOOD

(county seat)

ATCHISON, TOPEKA AND SANTA FE

Pecan Creek

Bayou

Willis Creek

Reservoir

Airfield

water

LAND FILL

GRAVEL PIT

Lewis Creek

377

3064

2524

2126

45

2 445 000 FEET

740 000 FEET

(Joins sheet 30)

(Joins sheet 36)

(Joins sheet 38)

(Joins sheet 45)

725 000 FEET

2 470 000 FEET

N

10000 Feet

3 Kilometers

Scale - 1:24000

38

N

(Joins sheet 31)

2 500 000 FEET

2 740 000 FEET

(Joins sheet 37)

(Joins sheet 39)

725 000 FEET

2 470 000 FEET

(Joins sheet 46)

Zephyr

ATCHISON TOPEKA AND SANTA FE

Blankell Creek

Blankell Dirt Creek

Blankell Branch

Groves Creek

Kelly Branch

House Branch

BROWN COUNTY

MILLS COUNTY

water

1467

590

218

84
183

10 000 Feet
3 Kilometers
2
1
5 000
0
1 000
2 000
3 000
4 000
5 000
.5
1

Scale - 1:24 000

This map is compiled on 1975 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies
Coordinate grid ticks and land division corners, if shown, are approximately positioned

BROWN AND MILLS COUNTIES, TEXAS — SHEET NUMBER 39

39

N

2 500 000 FEET

740 000 FEET

(Joins sheet 32)

(Joins sheet 40)

(Joins sheet 38)

(Joins sheet 47)

2 525 000 FEET

725 000 FEET

COUNTY

BROWN

MILLS

COUNTY

Beards Gap

Branch

Kelly

water

water

w

218

573

578

10000 Feet 5000

3 Kilometers 2 1 0

Scale - 1:24 000

This map is compiled on 1975 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BROWN AND MILLS COUNTIES, TEXAS — SHEET NUMBER 40

(40)

N

(Joins sheet 33)

2 555 000 FEET

740 000 FEET

(Joins sheet 39)

(Joins sheet 41)

2 530 000 FEET

725 000 FEET

(Joins sheet 48)

718

218

Creek

Mountain

Creek

Mountain

10 000 Feet

3 Kilometers

5 000

2

1

0

Scale - 1:24 000

0 1 000 2 000 3 000 4 000 5 000

.5

1

This map is compiled on 1975 aerial photography by the U.S. Department of Agriculture, Agriculture Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners shown are approximately positioned

2 560 000 FEET

(Joins inset, sheet 79)

740 000 FEET

COMANCHE COUNTY

HAMILTON COUNTY

Priddy

Becker Mountain

Cowhouse Creek

Cowhouse Creek

Creek

Creek

Washboard

(Joins sheet 40)

(Joins inset, sheet 59)

725 000 FEET

(Joins sheet 49)

2 585 000 FEET

41

N

10000 Feet

3 Kilometers

Scale - 1:24000

42

N

(Joins sheet 34)

2 380 000 FEET

720 000 FEET

COUNTY BOUNDARY

INDEFINITE

COLEMAN

705 000 FEET

(Joins sheet 51)

2 355 000 FEET

(Joins sheet 43)

Sand Creek

Clear Creek

Pecan Bayou

West Fork

water

10 000 Feet 3 Kilometers 2 1

5 000 0 1 000 2 000 3 000 4 000 5 000 .5 0

Scale - 1:24 000

BROWN AND MILLS COUNTIES, TEXAS — SHEET NUMBER 43

2 385 000 FEET

(Joins sheet 35)

720 000 FEET

Clear Creek

Clear Creek

water

1176

377

(Joins sheet 42)

(Joins sheet 44)

(Joins sheet 52)

2 410 000 FEET

705 000 FEET

N

10000 Feet

3 Kilometers

Scale - 1:24 000

5 000 4 000 3 000 2 000 1 000 0

.5 0 1

1 2

This map is compiled on 1975 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BROWN AND MILLS COUNTIES, TEXAS — SHEET NUMBER 44

(44)

N

(Joins sheet 36)

2 440 000 FEET

GRAVEL PIT

377

water

Lewis Creek

Indian Creek

water

water

w

10 000 Feet

3 Kilometers

5 000 4 000 3 000 2 000 1 000 0

2 1 .5 0

Scale - 1:24 000

(Joins sheet 43)

705 000 FEET

20 000 FEET

(Joins sheet 45)

(Joins sheet 53)

2 415 000 FEET

This map is compiled on 1975 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned

2 445 000 FEET

720 000 FEET

(Joins sheet 37)

(Joins sheet 44)

(Joins sheet 46)

(Joins sheet 54)

2 470 000 FEET

705 000 FEET

Doudle Creek

Pecan Bayou

Bayou Creek

MacKinally Pecan Bayou

N

10000 Feet

3 Kilometers

Scale - 1:24 000

(Joins sheet 38)

2 500 000 FEET

720 000 FEET

(Joins sheet 45)

(Joins sheet 47)

705 000 FEET

2 475 000 FEET

(Joins sheet 55)

N

10 000 Feet

3 Kilometers

5 000

2

1

Scale - 1:24 000

0

.5

1

1 000 0 1 000 2 000 3 000 4 000 5 000 Feet

COUNTY

BROWN

MILLS

COUNTY

COUNTY

Creek

Branch

Blanket

Kelly

water

Big

Branch

Blanket

Creek

Pecan Bayou

Long

Creek

Pompey

ROUND MOUNTAIN

TOPEKA AND SANTA FE

RICHEY

84 183

This map is compiled on 1975 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies
Coordinate grid ticks and land division corners, if shown, are approximately positioned

2 500 000 FEET

(Joins sheet 39)

720 000 FEET

water

Creek

Pompey

Long Pompey Mountain

Little Pompey Mountain

84
183

573

(Joins sheet 46)

(Joins sheet 48)

(Joins sheet 56)

2 525 000 FEET

705 000 FEET

N

10000 Feet

3 Kilometers

5 000 4 000 3 000 2 000 1 000 0

2 1 .5 0

Scale - 1:24 000

This map is compiled on 1975 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

48

N

(Joins sheet 40)

2 555 000 FEET

720 000 FEET

705 000 FEET

253 000 FEET (Joins sheet 57)

(Joins sheet 47)

(Joins sheet 49)

Mountain Creek

Courthouse Creek

Brown's Creek

Scale - 1:24 000

10000 Feet 5000 0 1 2 3 Kilometers

5 000 4 000 3 000 2 000 1 000 0 1 .5 0

This map is compiled on 1975 aerial photography by the U.S. Department of Agriculture. Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned

BROWN AND MILLS COUNTIES, TEXAS — SHEET NUMBER 49

49

N

2 560 000 FEET

720 000 FEET

(Joins sheet 41)

(Joins sheet 48)

(Joins sheet 50)

(Joins sheet 58)

2 580 000 FEET

705 000 FEET

Coushouse Creek

Creek

Washboard

575

10000 Feet 5 000 0

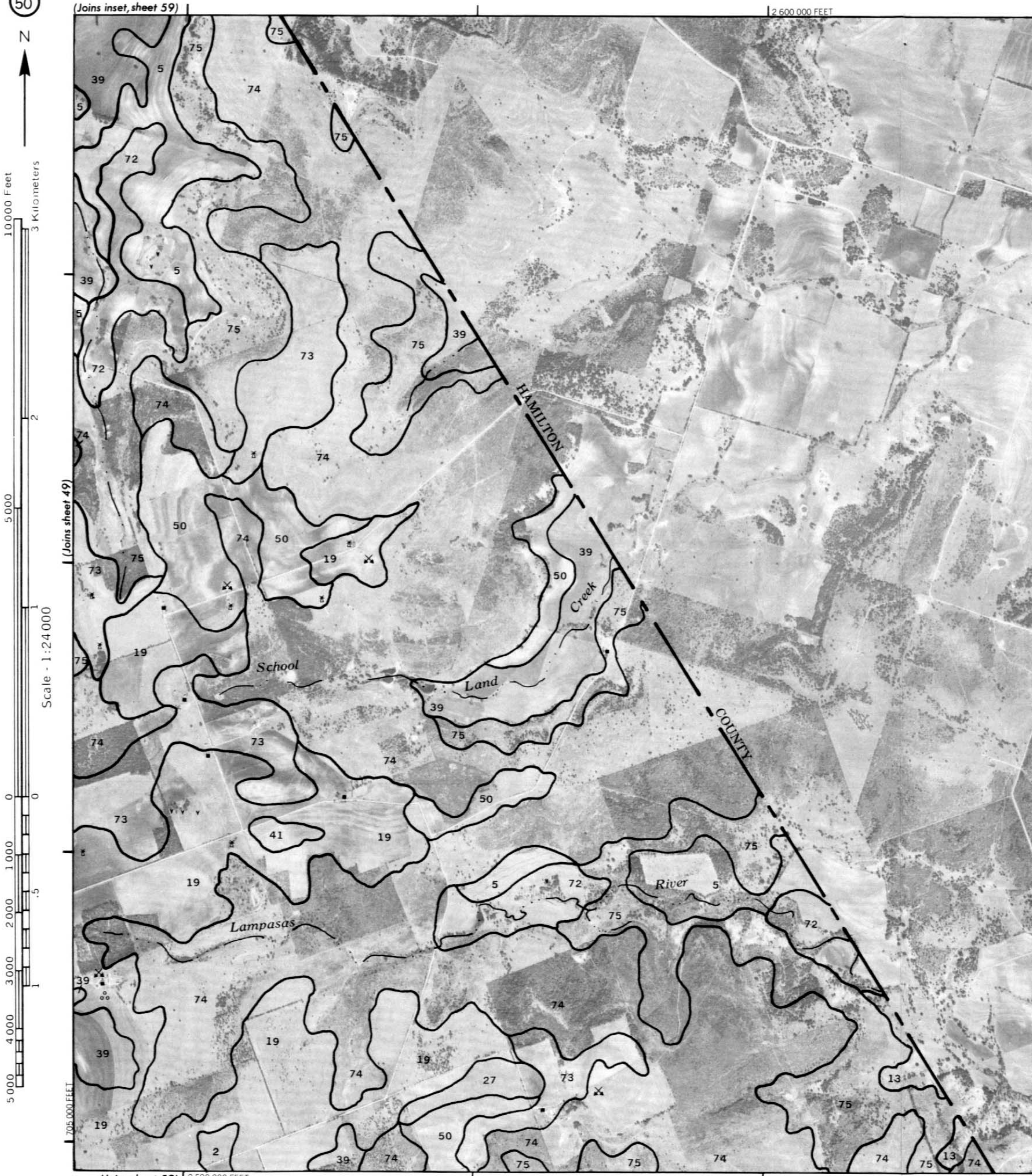
3 Kilometers 2 1 0

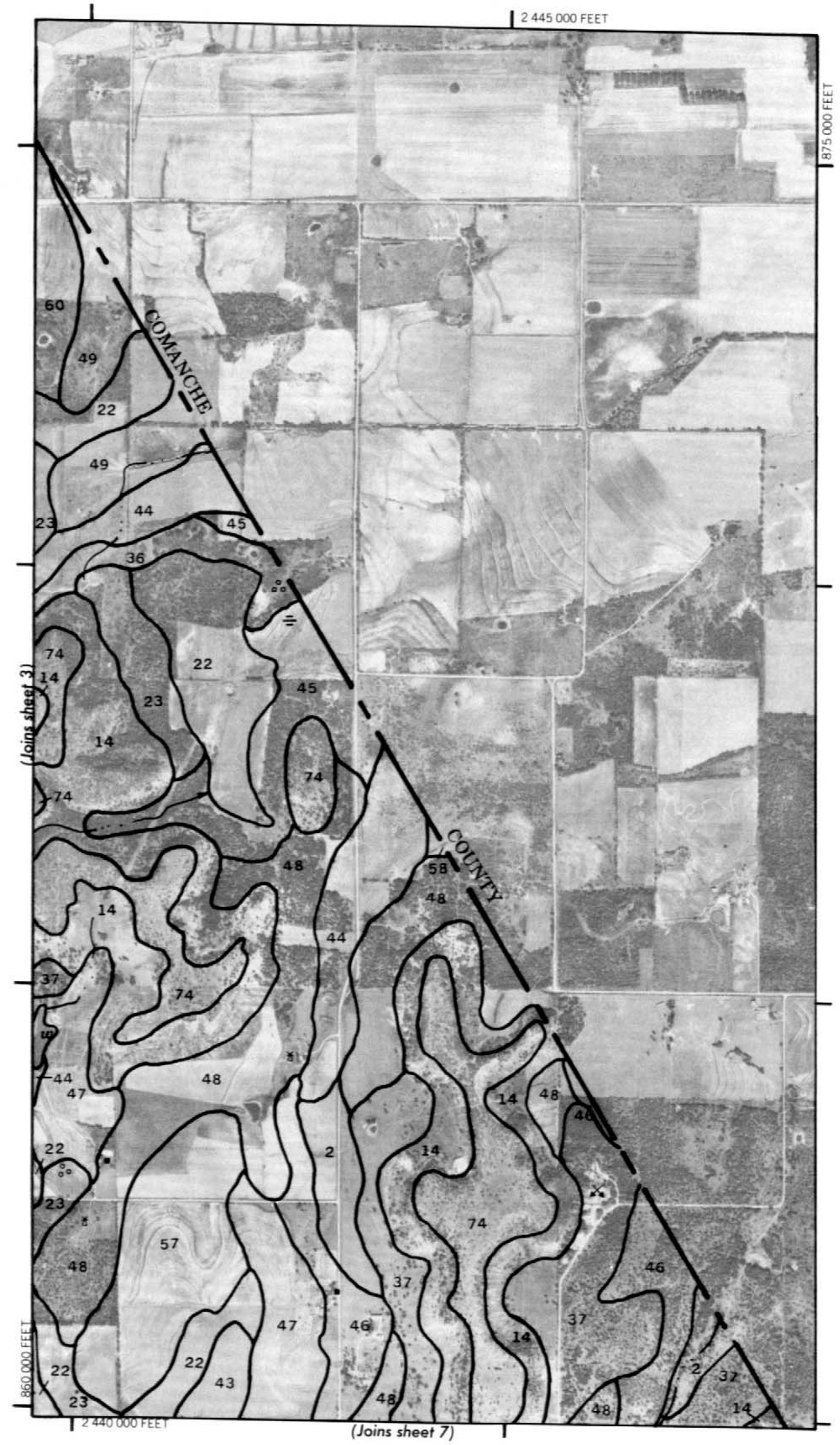
Scale - 1:24 000

5 000 4 000 3 000 2 000 1 000 0

1 .5 0

This map is compiled on 1975 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.





This map is compiled on 1975 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BROWN AND MILLS COUNTIES, TEXAS — SHEET NUMBER 51

51

2 355 000 FEET

(Joins sheet 42)

700 000 FEET

COUNTY

COLEMAN

(Joins sheet 52)

(Joins sheet 60)

2 380 000 FEET

685 000 FEET

N

Scale - 1:24 000

10000 Feet 3 Kilometers 5000 0 1000 2000 3000 4000 5000 2 1 0 .5 1

West Fork Clear Creek

Brookesmith

water

1176

586

52

BROWN AND MILLS COUNTIES, TEXAS — SHEET NUMBER 52

N

Scale - 1:24000

10000 Feet 3 Kilometers

5000 4000 3000 2000 1000 0 5000 2 1 .5 0 1

(Joins sheet 43)

(Joins sheet 51)

(Joins sheet 61)

(Joins sheet 53)

2 410 000 FEET

700 000 FEET

695 000 FEET

2 385 000 FEET

COGGIN LAKE

water

Creek

Clear

377

This map is compiled on 1975 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned

BROWN AND MILLS COUNTIES, TEXAS — SHEET NUMBER 53

53

2 415 000 FEET

(Joins sheet 44)

700 000 FEET

(Joins sheet 52)

(Joins sheet 54)

(Joins sheet 62)

2 440 000 FEET

685 000 FEET

N

Scale - 1:24 000

10000 Feet 5000 0 1 000 2 000 3 000 4 000 5 000

3 Kilometers 2 1 0 .5 1 2

Creek

Indian

Terrapin

Rough

Mackinally

water

This map is compiled on 1975 aerial photography by the U.S. Department of Agriculture. Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned

54

N

(Joins sheet 45)

2 470 000 FEET

(Joins sheet 53)

(Joins sheet 55)

685 000 FEET

(Joins sheet 63)

2 445 000 FEET

MacKinally Creek

Nick Fisk

Pecan Bayou

Pinthey Creek

COUNTY

COUNTY

BROWN

MILLS

10000 Feet 3 Kilometers

5000 4000 3000 2000 1000 0 5000

2 1 .5 0 1

Scale - 1:24000

This map is compiled on 1975 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned

2 475 000 FEET

700 000 FEET

(Joins sheet 46)

(Joins sheet 54)

(Joins sheet 56)

(Joins sheet 64)

685 000 FEET

2 500 000 FEET

BROWN COUNTY

MILLS COUNTY

Pecan Bayou

Long Branch

Big Blanket Creek

Pecan Bayou

Pecan Bayou

Fisk Creek

Big Blanket Creek

Pecan Bayou

Pecan Bayou

Pommey Creek

Pommey Creek

Panther Creek

N

Scale - 1:24 000

10 000 Feet

5 000

0

3 Kilometers

2

1

0

56

N

10 000 Feet
3 Kilometers
5 000
2
1
Scale - 1:24 000
0
1 000
.5
2 000
3 000
4 000
5 000
1

(Joins sheet 47)

2 525 000 FEET

700 000 FEET

(Joins sheet 55)

685 000 FEET

2 500 000 FEET

(Joins sheet 65)

(Joins sheet 57)

ATCHISON

TOPEKA

AND

SANTA

FE

Creek

Long

Hollow

Mullen

Willoughby

Farmers

Mullin

573

1029

84
183

BROWN AND MILLS COUNTIES, TEXAS — SHEET NUMBER 57

2 530 000 FEET

(Joins sheet 48)

57

N

700 000 FEET

(Joins sheet 56)

(Joins sheet 58)

10000 Feet

3 Kilometers

Scale - 1:24000

water

Creek

water

water

LAKE MERRITT

Brooms

water

84
183

(Joins sheet 66)

2 555 000 FEET

685 000 FEET

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Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BROWN AND MILLS COUNTIES, TEXAS — SHEET NUMBER 58

(58)

N

(Joins sheet 49)

2 585 000 FEET

705 000 FEET

(Joins sheet 57)

(Joins sheet 59)

695 000 FEET

2 560 000 FEET

(Joins sheet 67)

Scale - 1:24 000

10 000 Feet 3 Kilometers 5 000 2 0 1

5 000 4 000 3 000 2 000 1 000 0 .5 0 1

North Bonnett Gholson Huckabee Hill Caradan Creek Creek

575

This map is compiled on 1975 aerial photography by the U.S. Department of Agriculture. Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned

2 590 000 FEET

(Joins sheet 50)

700 000 FEET

(Joins sheet 58)

HAMILTON COUNTY

Creek

Merrill

South Lampasas River

Newton Point

water

2005

690 000 FEET

(Joins sheet 68)

2 615 000 FEET

2 588 000 FEET

730 000 FEET

(Joins sheet 41)

HAMILTON COUNTY

(Joins sheet 50)

2 592 000 FEET

725 000 FEET

59

N

10 000 Feet 3 Kilometers

5 000 0 1 000 2 000 3 000 4 000 5 000

Scale - 1:24 000

60

N

Scale - 1:24 000

10 000 Feet 5 000 0

3 Kilometers 2 1 0

(Joins sheet 51)

2 380 000 FEET

680 000 FEET

(Joins sheet 61)

(Joins sheet 69)

2 355 000 FEET

665 000 FEET

COUNTY

COLEMAN

Creek

Bayou

Branch

Crooked

This map is compiled on 1975 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BROWN AND MILLS COUNTIES, TEXAS — SHEET NUMBER 61

61

N

2 385 000 FEET

(Joins sheet 52)

680 000 FEET

(Joins sheet 60)

(Joins sheet 62)

(Joins sheet 70)

2 410 000 FEET

665 000 FEET

Dulin

Creek

water

Clear

Creek

COLORADO RIVER

SAN SABA COUNTY

10000 Feet 3 Kilometers

5000 2

0

5000 4000 3000 2000 1000 0

1 .5 0 1

Scale - 1:24000

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62

N

(Joins sheet 53)

2 440 000 FEET

(Joins sheet 61)

Indian Creek

Creek

Rough Creek

COUNTY

COUNTY

BROWN

MILLS

Creek

Comanche Creek

Indian Creek

(Joins sheet 63)

665 000 FEET

(Joins sheet 71)

2 415 000 FEET

580 000 FEET

10 000 Feet

3 Kilometers

5 000

2

1

Scale - 1:24 000

0

0

1 000

.5

2 000

1

3 000

4 000

5 000

2 445 000 FEET

680 000 FEET

665 000 FEET

2 470 000 FEET

(Joins sheet 54)

(Joins sheet 64)

(Joins sheet 62)

(Joins sheet 72)

N

Scale - 1:24 000

10000 Feet 5000 0 1000 2000 3000 4000 5000

3 Kilometers 2 1 0 .5 0 1 2

BROWN COUNTY

MILLS COUNTY

Panther Creek

Creek

Branch

Branch

Flatrock

Flatrock

Little

Buffalo

water

water

64

N

(Joins sheet 55)

2 500 000 FEET

685 000 FEET

Panther

water

Creek

Pecan

Blanket

Creek

Big

Pecan

Bayou

Creek

Bayou

Rough

Keen

573

(Joins sheet 63)

(Joins sheet 65)

(Joins sheet 73)

2 475 000 FEET

665 000 FEET

10000 Feet

3 Kilometers

5 000 4 000 3 000 2 000 1 000 0

2 1 .5 0

Scale - 1:24000

This map is compiled on 1975 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies
Coordinate grid ticks and land division corners, if shown, are approximately positioned

2 500 000 FEET

685 000 FEET

(Joins sheet 56)

(Joins sheet 64)

(Joins sheet 66)

(Joins sheet 74)

2 530 000 FEET

670 000 FEET

N

Scale - 1:24 000

10000 Feet

5000

3 Kilometers

2

1

0

1000

2000

3000

4000

5000

.5

1

Creek

Farmers Creek

Hampton

Pecan

Bayou

Mullin Creek

Brown's water

573

N

Scale - 1:24000

10000 Feet 3 Kilometers

(Joins sheet 57)

(Joins sheet 65)

(Joins sheet 67)

(Joins sheet 75)

2 555 000 FEET

685 000 FEET

670 000 FEET

2 530 000 FEET

LAKE MERRITT

water

water

Creek

Browns

ATCHISON

TOPEKA

AND

SANTA FE

84
183

2 560 000 FEET

685 000 FEET

(Joins sheet 58)

(Joins sheet 66)

(Joins sheet 68)

(Joins sheet 76)

2 585 000 FEET

570 000 FEET

Mustang

Lookout Mountain

North

Bennett

Creek

Creek

Mushing water

Creek

575

2005

N

10 000 Feet

5 000

3 Kilometers

2

1

0

Scale - 1:24 000

N

Scale - 1:24 000

10000 Feet 5000 0 1 2 3 Kilometers

(Joins sheet 59)

(Joins sheet 67)

(Joins sheet 77)

(Joins inset, sheet 16)

2 615 000 FEET

685 000 FEET

620 000 FEET

2 590 000 FEET

Cholson Creek

North Bennett Mustang Creek

Creek

South Hawley Point

HAMILTON COUNTY

Lampasas River

BROWN AND MILLS COUNTIES, TEXAS — SHEET NUMBER 69

2 355 000 FEET

(Joins sheet 60)

(Joins sheet 70)

2 380 000 FEET

650 000 FEET

COLEMAN COUNTY

RUNNELS COUNTY

Winchell

Crooked Hollow

Conner Branch

Branch

COLORADO RIVER

MC CULLOCH COUNTY

377

N

10 000 Feet 3 Kilometers

5 000 4 000 3 000 2 000 1 000 0 0 .5 1

Scale - 1:24 000

70

N

(Joins sheet 61)

(Joins sheet 69)

(Joins sheet 71)

2 410 000 FEET

660 000 FEET

650 000 FEET

2 385 000 FEET

Connor Branch

COLORADO RIVER

SAN SABA RIVER

COLORADO COUNTY

MC CULLOCH COUNTY

10000 Feet 3 Kilometers

5 000 4 000 3 000 2 000 1 000 0 2 1 0

Scale - 1:24 000

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BROWN AND MILLS COUNTIES, TEXAS — SHEET NUMBER 71

71

2 415 000 FEET

665 000 FEET

(Joins sheet 62)

(Joins sheet 70)

(Joins sheet 72)

2 440 000 FEET

650 000 FEET

N

Scale - 1:24 000

10000 Feet 5000

3 Kilometers

Indian Creek

BROWN COUNTY

MILLS COUNTY

COLORADO RIVER

SAN SABA COUNTY

SABA COUNTY

SAN COLORADO RIVER

Commanche Creek

586

45

574

N

Scale - 1:24000

10000 Feet 3 Kilometers 5000 2 1 0 1 .5 0 1000 2000 3000 4000 5000

(Joins sheet 63)

(Joins sheet 71)

(Joins sheet 73)

(Joins sheet 79)

2 470 000 FEET

2 445 000 FEET

665 000 FEET

650 000 FEET

Creek

Creek

Creek

Hanna

Mountain

Laird

Hollow

Rough

Hog

Buffalo

SAN SABA COUNTY

COLORADO RIVER

COLORADO RIVER

574

574

This map is compiled on 1975 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned

2 475 000 FEET

665 000 FEET

(Joins sheet 64)

(Joins sheet 72)

(Joins sheet 74)

(Joins sheet 80)

2 500 000 FEET

650 000 FEET

N

Scale - 1:24 000

10 000 Feet 5 000 0 1 000 2 000 3 000 4 000 5 000

3 Kilometers 2 1 0 1 .5 0 1 2

Creek

Keen Creek

Hanna Mountain

Hanna Valley

Flatrock Creek

Rum Creek

Crooked Creek

74

N

(Joins sheet 65)

2 525 000 FEET

665 000 FEET

Bayou

Pecan

Smokey

Bend

Gibbs

Hollow

Creek

South

water

Brown

Rough

Hollow

Creek

(Joins sheet 73)

Hog

Browns

Hollow

574

King

Creek

Pecan

650 000 FEET

Bayou

Cedar

Hollow

Creek

Grindstone

Hollow

Prescott

(Joins sheet 81)

2 505 000 FEET

(Joins sheet 75)

10000 Feet

3 Kilometers

5 000

2

1

Scale - 1:24 000

0

.5

1

1 000

2 000

3 000

4 000

5 000

This map is compiled on 1976 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

2 530 000 FEET

665 000 FEET

(Joins sheet 66)

(Joins sheet 74)

(Joins sheet 76)

(Joins sheet 82)

2 555 000 FEET

650 000 FEET

N

Scale 1:24000

10000 Feet 5000 0 1 2 3 Kilometers

Goldthwaite (county seat)

Airfield

South Browns Creek

Branch Creek

Cryers Creek

Prescott Creek

ATCHISON TOPEKA AND SANTA FE

84 183 16 572 2005 574 3023

BROWN AND MILLS COUNTIES, TEXAS — SHEET NUMBER 76

76

N

Scale - 1:24 000

10000 Feet 3 Kilometers

5 000 4 000 3 000 2 000 1 000 0 1 .5 0 1 2

(Joins sheet 67)

(Joins sheet 75)

(Joins sheet 77)

(Joins sheet 83)

2 585 000 FEET

665 000 FEET

650 000 FEET

2 560 000 FEET

Middle

Bennett

KEMP LAKE

Creek

water

Bennett Creek

Willow

Spring Branch

Creek

Bennett

South

water

Creek

This map is compiled on 1975 aerial photography by the U.S. Department of Agriculture. Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned

BROWN AND MILLS COUNTIES, TEXAS — SHEET NUMBER 77

2 590 000 FEET

665 000 FEET

(Joins sheet 68)

(Joins sheet 76)

(Joins sheet 78)

(Joins sheet 84)

2 615 000 FEET

650 000 FEET

77

N

10 000 Feet

3 Kilometers

Scale - 1:24 000

5 000 4 000 3 000 2 000 1 000 0

1 .5 0 1 2

water

Center City

Bennett Creek

South Bennett Creek

Bennett Creek

Owens Branch

Hollow Bee Creek

78

N

Scale - 1:24 000

10 000 Feet 5 000 4 000 3 000 2 000 1 000 0

3 Kilometers 2 1 0 .5 1

(Joins inset, sheet 16)

2 645 000 FEET

665 000 FEET

625 000 FEET

620 000 FEET

650 000 FEET

2 625 000 FEET

2 620 000 FEET

(Joins sheet 85)

(Joins sheet 77)

(Joins sheet 89)

HAMILTON COUNTY

LAMPASAS COUNTY

Star

Slaughter Creek

Bennett Branch

1047

84

(Joins inset, sheet 69)

(Joins sheet 72)

(Joins sheet 80)

(Joins sheet 33)

(Joins sheet 41)

2 445 000 FEET

2 560 000 FEET

2 575 000 FEET

2 470 000 FEET

645 000 FEET

750 000 FEET

745 000 FEET

630 000 FEET

COLORADO RIVER

SAN SABA COUNTY

COMANCHE COUNTY

Regency

Hanna Valley

Hog Creek

Little Mountain

GRAVEL PIT

N

10 000 Feet 3 Kilometers

5 000 4 000 3 000 2 000 1 000 0 1 .5 0 1 2

Scale - 1:24 000

N

Scale - 1:24000

10000 Feet 3 Kilometers

5000 2 1 0

5000 4000 3000 2000 1000 0 .5 1

(Joins sheet 73)

(Joins sheet 79)

(Joins sheet 81)

2 500 000 FEET

645 000 FEET

630 000 FEET

626 000 FEET

624 000 FEET

2 475 000 FEET

2 485 000 FEET

2 490 000 FEET

(Joins lower right)

(Joins inset)

Flatrock Creek

Crooked Run

Valley

Jones

Valley

COLORADO

SAN SABA

RIVER

COUNTY

BROWN AND MILLS COUNTIES, TEXAS — SHEET NUMBER 81

81

(Joins sheet 80)

2 505 000 FEET

645 000 FEET

(Joins sheet 74)

(Joins sheet 82)

(Joins sheet 86)

2 530 000 FEET

N

Grindstone Hollow

Pecan Bayou

Prescott Creek

Crabtree Creek

COLORADO RIVER

SAN SABA COUNTY

10000 Feet

3 Kilometers

Scale - 1:24 000

BROWN AND MILLS COUNTIES, TEXAS — SHEET NUMBER 82

82

N

(Joins sheet 75)

(Joins sheet 81)

(Joins sheet 83)

(Joins sheet 87)

2 555 000 FEET

645 000 FEET

630 000 FEET

2 530 000 FEET

GRAVEL PIT

ATCHISON, TOPEKA AND SANTA FE

Cedar Nob

Chance Creek

Bull Creek

Bull Creek

Vabor's Creek

10000 Feet 3 Kilometers

5000 2

Scale - 1:24000

5000 4000 3000 2000 1000 0 .5 0 1

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BROWN AND MILLS COUNTIES, TEXAS — SHEET NUMBER 83

83

N

2 560 000 FEET

645 000 FEET

(Joins sheet 76)

(Joins sheet 84)

(Joins sheet 82)

(Joins sheet 88)

2 585 000 FEET

630 000 FEET

572

South Bennett Branch

Creek

Hollow

Buckhorn

North

Simms Creek

Yahours

Creek

Shaw Creek

TOPEKA

ATCHISON

SANTA FE

10000 Feet

3 Kilometers

5 000 4 000 3 000 2 000 1 000 0

2 1 0

Scale - 1:24 000

BROWN AND MILLS COUNTIES, TEXAS — SHEET NUMBER 84

84

N

(Joins sheet 77)

2 615 000 FEET

645 000 FEET

(Joins sheet 83)

(Joins sheet 85)

Bar Gap

Russell Gap

Nesbit

Russell

Branch

Branch

572

572

630 000 FEET

2 590 000 FEET

(Joins sheet 89)

10 000 Feet 5 000 0

3 Kilometers 2 1 0

Scale - 1:24 000

5 000 4 000 3 000 2 000 1 000 0

1 .5 0

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Coordinate grid ticks and land division corners, if shown, are approximately positioned

BROWN AND MILLS COUNTIES, TEXAS — SHEET NUMBER 85

85

2 620 000 FEET

645 000 FEET

(Joins sheet 78)

(Joins sheet 84)

(Joins inset, sheet 78)

2 645 000 FEET

630 000 FEET

N

10000 Feet

5000

3 Kilometers

2

1

0

Scale 1:24000

.5

1

0

5 000 4 000 3 000 2 000 1 000 0

Bennett

Slaughter Branch

Hollow

Pigfoot

Creek

HAMILTON COUNTY

LAMPASAS COUNTY

LAMPASAS COUNTY BOUNDARY

APPROXIMATE

Payne Gap

Payne Mountain

1047

572

4047

86

BROWN AND MILLS COUNTIES, TEXAS — SHEET NUMBER 86

(Joins sheet 81)

2 530 000 FEET

625 000 FEET

N

10000 Feet

3 Kilometers

5 000

2

1

1:24 000

Scale - 1:24 000

0

1 000

2 000

3 000

4 000

5 000

.5

1

610 000 FEET

2 505 000 FEET

(Joins sheet 87)

(Joins inset)

RIVER

COLORADO

Valley

Big

SAN SABA

COUNTY

Creek

Cabbage

Pecan

Bull

(Joins lower right) 2 530 000 FEET

(Joins sheet 90) 607 000 FEET

603 000 FEET

2 525 000 FEET

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Coordinate grid ticks and land division corners, if shown, are approximately positioned.

BROWN AND MILLS COUNTIES, TEXAS — SHEET NUMBER 87

2 530 000 FEET

625 000 FEET

(Joins sheet 82)

(Joins sheet 86)

(Joins sheet 88)

(Joins sheet 90)

2 560 000 FEET

610 000 FEET

COLORADO RIVER

SAN SABA COUNTY

Bull Creek

Nabors Creek

Shoats Creek

Rocky Creek

San Saba Peak

87

N

Scale - 1:24 000

10 000 Feet 5 000

3 Kilometers 2 1 0 1

88

N

(Joins sheet 83)

2 585 000 FEET

(Joins sheet 87)

(Joins sheet 89)

610 000 FEET

2 560 000 FEET

(Joins sheet 91)

10000 Feet 3 Kilometers 2 5000 1 0

Scale - 1:24000

5000 4000 3000 2000 1000 0

Creek

Shaw Creek

San Saba Peak 62

Rocky Creek

Billiot Creek

North Simms Creek

Creek

Cove Creek

ATCHISON

TOPEKA

AND

SANTA

FE

183

BROWN AND MILLS COUNTIES, TEXAS — SHEET NUMBER 89

89

2 590 000 FEET

625 000 FEET

(Joins sheet 84)

(Joins inset, sheet 78)

(Joins sheet 88)

(Joins inset, sheet 92)

2 615 000 FEET

610 000 FEET

N

Nesbit Branch

Russell

Hensley Spring

North Creek

Simms' Creek

BREAD TRAY MOUNTAIN

Bee Cave

Branch

BOUNDARY

Creek

COUNTY

Bear Cove

LAMPASAS

APPROXIMATE

Scale - 1:24 000

10000 Feet 5 000 0

3 Kilometers 2 1 0

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Coordinate grid ticks and land division corners, if shown, are approximately positioned.

90

N

(Joins sheet 87)

2 555 000 FEET

605 000 FEET

Catclaw Bend

COLORADO SAN SABA COUNTY RIVER

COLORADO RIVER

Rocky Blowout Creek

Creek

Paint Creek

Green Mountain

Bomb Target

(Joins sheet 91)

590 000 FEET

2 530 000 FEET

(Joins sheet 92)

Scale - 1:24 000

10 000 Feet 3 Kilometers 2 1 0

5 000 1 000 2 000 3 000 4 000 5 000 .5 0 1

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Coordinate grid ticks and land division corners, if shown, are approximately positioned

BROWN AND MILLS COUNTIES, TEXAS — SHEET NUMBER 91

91

2 560 000 FEET

605 000 FEET

(Joins sheet 88)

(Joins sheet 92)

(Joins sheet 90)

(Joins inset, sheet 33)

2 585 000 FEET

590 000 FEET

N

10000 Feet

3 Kilometers

5000

2

1

Scale - 1:24 000

5 000 4 000 3 000 2 000 1 000 0

1 .5 0

Creek

Creek

Antelope

North

Elliot

ATCHISON TOPEKA AND SANTA FE

BOUNDARY

COUNTY

LAMPASAS

APPROXIMATE

183

This map is compiled on 1975 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned

BROWN AND MILLS COUNTIES, TEXAS — SHEET NUMBER 92

92

N

(Joins sheet 90)

2 555 000 FEET

585 000 FEET

(Joins inset, sheet 33)

(Joins sheet 89)

2 600 000 FEET

605 000 FEET

(Joins sheet 91)

600 000 FEET

570 000 FEET

2 590 000 FEET

2 530 000 FEET

COLORADO RIVER

SAN SABA COUNTY

LAMPASAS COUNTY

BOUNDARY

APPROXIMATE

Bomb Target

Elliot Creek

10 000 Feet

3 Kilometers

5 000

2

Scale - 1:24 000

0

1

5 000 4 000 3 000 2 000 1 000 0

.5

1

0

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Coordinate grid ticks and land division corners, if shown, are approximately positioned